VETERINARY MEDICINE

OCTOBER 1946

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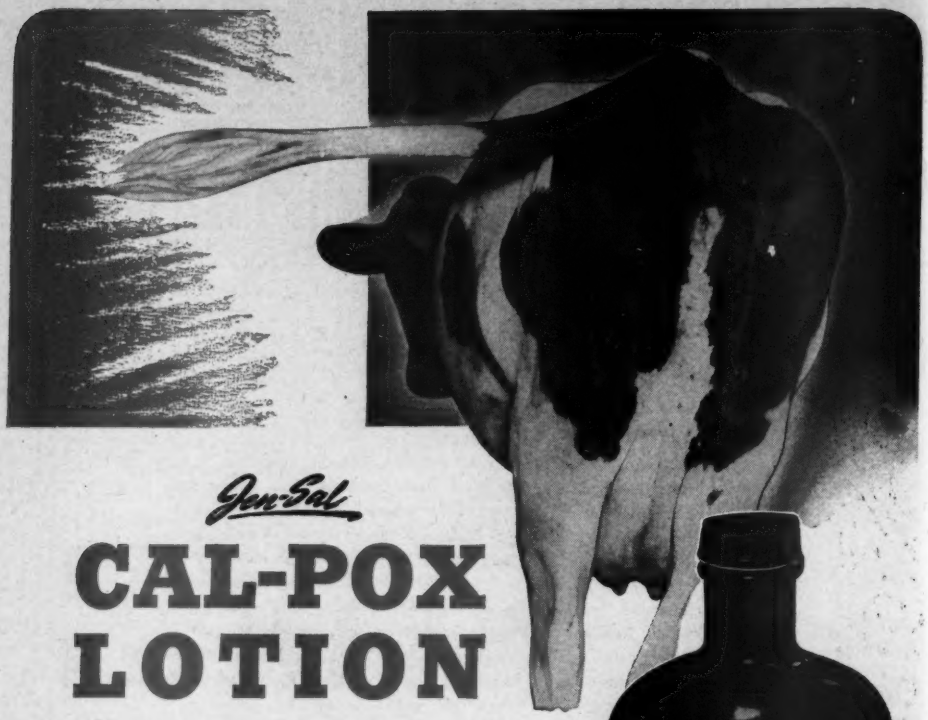

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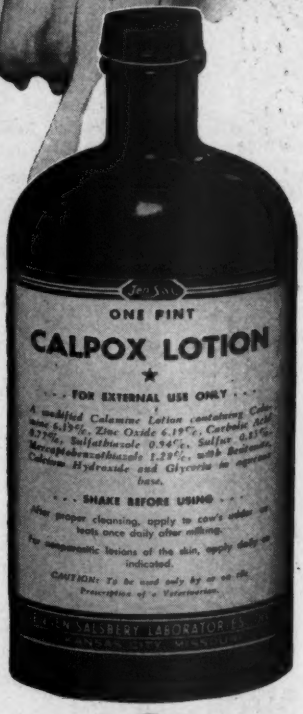

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83rd Annual Meeting of the A.V.M.A.

IN the first 30 years of its existence, the United States Veterinary Medical Association, precursor of the A.V.M.A., met in Boston 22 times—three times in annual session, 19 times for semiannual meetings. No meetings were held in that city from 1892 to 1946, a period of 54 years. The attendance at the 29th annual meeting held September 20, 21 and 22, 1892, was 49 members and 22 visitors. It was the first three-day meeting held by the association. Seven papers were presented; one by D. E. Salmon (27 printed pages); others by W. L. Williams (16 pages); J. F. Winchester (34 pages); F. L. Kilborne (15 pages) and short papers by John W. Gadsden, Wyatt Johnson (M.D.) and William Bryden. Five committee reports were presented—Intelligence and Education, Army Legislation, Publication, Food Inspection and Diseases. Two state secretaries, S. Stewart of Iowa and Wm. Herbert Lowe of New Jersey made reports. Rush Shippen Huidekoper of Pennsylvania was president; W. L. Williams of Indiana was elected president for the ensuing year.

JAMES FARQUHARSON
Because no regular meeting was held in 1945 Doctor Farquharson was president for two years.

WILLIAM A. HAGAN
Dean, New York State Veterinary College and president-elect for 1946-47.

U. S. D. A. Photograph

BENNETT T. SIMMS
Like the president, Doctor Simms had served two years as president-elect.

At the recent meeting of the A.V.M.A. in Boston the attendance was approximately 1700. Sixty-five papers were included in the program and perhaps half as many committee reports were given. James Farquharson of Colorado was president, Chief Bennett T. Simms of the B.A.I., president elect, was in-

stalled as president at the close of the meeting and Dean W. A. Hagan of New York was chosen president elect. The pleasant weather and excellent plans of the local committee on arrangements made the meeting a delight for those in attendance. A scientific program of high quality and unusual diversification made it a profitable meeting.

Complaint is often heard that the progress of the veterinary profession is slow. Perhaps it is, but any comparison of the two Boston meetings demonstrates that, over a period of a half-century, progress has been real. They resembled one another only in being held in the same city and in each featuring a boat ride for entertainment. Food inspection was the only subject discussed at both meetings.

Awards

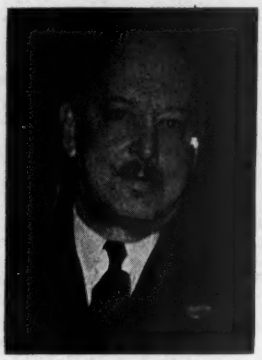
Four awards were made at the meeting:

Photo by LOOK, America's Family Magazine
T. H. FERGUSON

1. The Twelfth International Congress Prize was awarded to Dr. T. H. Ferguson, practitioner, Lake Geneva, Wisconsin and president of the A.V.M.A. 1929-30. The citation recited, "Your fulsome professional life and exemplary citizenship, both of which are engrossed with service far beyond the conventional line of duty," and "In bovine medicine and surgery, you have shaped the destiny of coming generations in many respects, and you have taught your own wisdom of collaboration regardless of a busy life."

Doctor Ferguson, ONT '96 has practiced in Lake Geneva 50 years. Last year his practice was the subject of a feature article and many illustrations in *Look* magazine.

2. The A.V.M.A. award went to Dr. John R. Mohler, Washington, D. C., former Chief of the Bureau of Animal Industry and president of the A.V.M.A. in 1912-13. Quoting from the citation—"The difficult task of mobilizing, organizing and guiding these forces, and co-

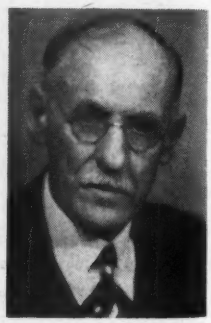


JOHN R. MOHLER
No one was more pleased by the announcement that meat inspection would be returned to the B.A.I. than Doctor Mohler. He might have said, "I told you so." but he didn't.

ordinating them with our vast and highly diversified agricultural and livestock interests during the period of your service, summarizes the reason for this citation. The forty-six years of service you gave to your country are an example of veterinary medical science and national economics working hand-in-hand."

Doctor Mohler was a member of the B.A.I. for 46 years, and chief of the Bureau 26 years.

3. The Borden Award was conferred upon Dr. W. E. Cotton, Professor of Veterinary Science, Alabama Polytechnic Institute, Auburn, Ala.; former Superintendent of the B.A.I. Experiment Station at Bethesda, Md. The citation recited for "outstanding achievement in contributing to the control of dairy cattle diseases." It also pointed particularly to his work in the discovery that the *Brucella abortus* is eliminated in the milk of infected cattle, and to his part in the development of strain 19 vaccine against brusellosis for which he gained world wide recognition.



W. E. COTTON

The doctor served in the B.A.I. 44 years; retiring in 1937.

Doctor Cotton's work in the field of tuberculosis was also cited, the citation stating "your investigation contributed much to the control of the disease, and the protection of human health."

4. The Veterinary Humane Act Award was won by John Newton, a 12-year-old, school boy of Columbus, Ohio, for doing "more than a man's job in helping to establish National Cat Week observance in the United States."

Meat Inspection Returned to B.A.I.

The statement that received the greatest applause at the Annual Banquet was the announcement that the federal Meat Inspection Service will be transferred from the Production and Marketing Administration, which has been operating it since 1942 as a wartime measure, to the Bureau of Animal Industry, which established it and conducted it with distinction and near universal approval for a half century. Administration of the "28-Hour Law" and related functions will be transferred along with the meat inspection.

The New Officers

In addition to Dean Hagan, chosen president-elect, other officers elected were: Vice-presidents (first to fifth): Ronald Gwalkin, Hull, Quebec; Ralph West, Sr., St. Paul, Minn.; John Gilman, Memphis, Tenn.; C. R. Curtis, Portage, Wisc., and E. L. Stubbs, Philadelphia, Pa. Treasurer: J. V. Lacroix, Evanston, Ill.

President's Annual Address

President Farquharson launched his annual address on a critical plane. His criticisms were widely distributed and in the main constructive. Only the military veterinary service entirely escaped presidential barbs. A majority of the veterinary colleges were criticized for not providing adequate clinical instruction for students, for employing insufficiently trained faculty members and for placing too much emphasis on the scholastic attainments and insufficient stress on background, personality and attitude in screening applicants for admission.

"The quality of veterinary service sponsored by the U.N.R.R.A. has been far below the accepted standards of the profession," he declared. "Many responsible duties and positions were assigned to men whose background, training and experience did not justify the appointments."

The livestock sanitary and regulatory services of the several states was rated from good to corrupt. And those responsible for failures such as has characterized the handling of rabies, hog cholera and bovine brucellosis were castigated.

Doctor Farquharson also levelled sharp criticism of some "retail biologic and drug interests" which he said "are organized to prey upon the livestock industry and flood the country with nostrums." He charged that they have now "entered some of the schools of pharmacy with their propaganda." He declared that "they offer a course lasting six days and propose to teach drugstore attendants zootechnics, sanitation, anatomy-physiology, bacteriology, serum and vaccine production and therapy, hog cholera antiserum and hog cholera virus production and use, pediatrics, poultry diseases, adult animal diseases, parasite and insect control, jurisprudence, drugstore veterinary department and counter display." As a result of their activities the health of our livestock is endangered.

There follow brief summaries or comment on important papers presented at the meeting.

Army Veterinary Service

Seven papers were presented dealing with as many phases of veterinary service in the armed forces during the late War, and related subjects.

1. In a general discussion, Col. J. A. McCallam, V.C., Chief of the Veterinary Division in the Surgeon General's Office, paid high tribute to the more than 2000 civilian veterinarians who, when commissioned in the military service, "adapted themselves readily and laudably to the tremendous wartime task of inspecting the food for an army of eight million.

The Chief of the Veterinary Division entertains no doubt that veterinary food inspection is a permanent institution so far as the army is concerned. Because of their knowledge of animal pathology and food hygiene "no other profession or group begins to approach veterinarians' skill" in the inspection of army food.

2. The role of veterinary medicine in the occupation of Japan was discussed by Col. Oness H. Dixon, V.C. The Veterinary Affairs Division is a part of the general headquarters of the Supreme Commander. It "advises on all matters pertaining to animal health, animal diseases hazardous to human health, and to meat and other products of animal origin for civilian consumption. Its primary mission is to salvage, control and rehabilitate the animal industry of Japan."

The Veterinary Affairs Division is gradually reëstablishing the Japanese veterinary service. Before the war Japan had 23 veterinary colleges with 4000 students. It had 21,878 licensed veterinarians—not all were graduates. The most glaring weakness of veterinary education in Japan was insufficient practical and clinical instruction and inadequate laboratory facilities. The course was three years in length.

The Japanese Army contained more than

5000 veterinarians in grades from second lieutenant to lieutenant general.

The more important livestock diseases in Japan are: equine infectious anemia, equine infectious abortion, equine osteomalacia, bovine infectious abortion, swine plague, hog cholera, fowl pest and pullorum disease.

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3. Research at the Japanese Institute for Veterinary Research at Posan, Korea, was discussed by Maj. R. M. Madson, V.C. At the time of American occupation, three diseases were being studied:

a. Rinderpest is a constant threat to Korea from across the Manchurian border; the Japanese maintained an "immune zone" by vaccinating cattle in a 10-mile-wide belt along the frontier.

b. "Third virus" disease of swine, a chronic ailment affecting young pigs; the Japanese have developed a serum which they claim will protect day-old pigs against the infection.

"Third virus" disease of swine is so called because it is the orient's third important virus causing illness in swine; the others being hog cholera and swine influenza.

c. Fowl pest, known as Newcastle disease in Britain and pneumoencephalitis in America. The Japanese have developed a chick-embryo vaccine for which high efficiency is claimed in establishing immunity for from two to five months.

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4. Veterinary preventive medicine in civil affairs and military government in northwest Europe from D-Day to V-Day is the long title of a paper presented by Lt. Col. Frank A. Todd. The history of European wars is replete with the record of the devastating sweep of animal plagues following all considerable troop movements. With this in mind a veterinary service was early established in the military and civil governments of the Allied Forces to follow the combatant troops across France and the Low Countries.

The principal duties of this service were to prevent the introduction and spread of the more serious infectious diseases of animals; to control and, insofar as possible, eradicate such diseases; to control the less disastrous but economically important diseases, and to reëstablish sanitary regulations affecting the production and quality of meat and milk and insure their enforcement as a public health measure.

U. S. Army veterinary officers were detailed for duty with the military and civil affairs government staffs to advise, help plan and supervise matters relating to animal diseases. A system of prompt notification of disease outbreaks, rapid establishment of control measures and speedy distribution of essential supplies were developed and put into operation.

"Wherever possible, the help of existing civilian veterinary services and organizations was sought."

"Outbreaks of anthrax, hog cholera, swine erysipelas, foot-and-mouth disease and other serious diseases were encountered and dealt with effectively by veterinary officers in collaboration with civilian veterinarians. The veterinary program set up in northwest Europe has aided the liberated countries immeasurably in keeping animal disease under control, thus conserving livestock for the production program which is vital to feeding the inhabitants and rebuilding the countries."

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5. Dr. Richard E. Shope of the Rockefeller Foundation, Princeton, New Jersey, gave many of the details of the experimental wartime studies on rinderpest.

"If rinderpest had been introduced on this continent either accidentally or purposely during the war, it would have had serious consequences since we were completely unprepared to combat it. Because the disease might have been used against us by the enemy, the Canadian Department of National Defense and the United States War Department, acting jointly, established a laboratory for the purpose of developing as rapidly as possible, adequate means of protection against rinderpest. A supply of Kelser bovine tissue vaccine, known to be effective, was first prepared to have ready for use in case an emergency arose before we had succeeded in developing a more economical and more readily prepared vaccine. After this, efforts were made to adapt the virus to growth in embryonating eggs in the hope of being able to utilize egg-propagated virus in vaccine production. The virus was successfully adapted to eggs, the adaptation occurring in two stages, and, furthermore, it was found that prolonged serial passage of the virus in eggs resulted in its attenuation for cattle. The attenuated egg-adapted virus proved completely safe for use in cattle and conferred a solid immunity against rinderpest. A large supply of this vaccine was prepared and held in readiness should the need for its use arise.

"In the course of our studies it was found that, by a hitherto unused alternating passage technic, the virus could be adapted to rabbits. Also it was discovered that the virus persisted in chicks hatched from infected eggs and that these chicks, as well as those infected at one day of age, developed neutralizing antibodies for the virus. These observations proved valuable in conducting our studies of rinderpest."

6. Veterinary sanitary problems of air transport was discussed by Lt. Col. Benj. D. Blood, V.C. Global air traffic is not a goal, but a present reality. "Commercial air transportation has developed at such a pace that it is already a major factor in our postwar economy."

Prewar air traffic was concerned mainly with passenger service but much of the emphasis is directed at present to cargo transport. The potentials in this field are stupendous. The sky is the limit, literally, as well as figuratively. Pet animals are already a common item of air cargo and the great numbers of horses carried over the "hump" from India and Burma to China demonstrated the possibilities in the transport of large animals. Already horses are being transported by air from one race track to another. A recent air shipment of cattle to South America is said to have saved 50 days over surface transport. African wild animals for American zoos and South American chinchillas for American fur farmers have been shipped by air in recent months. Poultrymen have found that by far the most economical way to ship baby chicks and hatching eggs long distances is by airplane.

Live animal cargo intimately concerns the veterinary profession because of its disease introducing and disease spreading potential. The possibility exists of introducing insect or other invertebrate carriers or disseminators of animal diseases, in air cargoes other than animal and even in passenger planes. Such introduction may be the means of importing foreign animal plagues or of spreading more widely and more rapidly those already here. Garbage disposal by planes from countries where exotic animal plagues are enzootic, requires the regulations similar to those now imposed on ships from such countries. That airplanes may, in an emergency or otherwise, land anywhere in the country, whereas ships can dock only at ports, adds not only to the need for such regulations but also to the difficulty of enforcing them.

To the present practically no attention has been given to the air transport of insects capable of introducing animal disease. All attention has been centered upon human disease carriers and insect carriers of human diseases. Veterinary aspects of the situation urgently need study.

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7. A discussion of sanitary problems encountered in the inspection of fish for army use was presented by Col. Jesse D. Derrick, V.C. Army purchases of fish in Boston and nearby cities on the New England coast approximated 21 million pounds annually. Inspection includes control of sanitation on the boat and methods of handling (must not be forked) and storage (must be iced and not bruised) on the boat and supervision from the time the catch is brought ashore until the product is served in the soldiers' mess. Fish may age in ice as rapidly as meat at 70° F. The temperature of fish should never rise above 45° F.

Fish are of three grades, fresh, stale (but edible) and putrid. Only the first grade is purchased by the Army. "Fresh fish have a bright appearance. Eyes are full and clear, without opacity. Gills are bright red. Gill covers and mouths are closed. Scales are glistening and adherent. Abdominal walls are firm and elastic, with no evidence of bloating or discoloration. The flesh is firm, elastic and tight on the bones."

Fillets are examined for bruises, parasites, blood clots and other unsatisfactory conditions. They are washed in a 10 to 30% brine which is renewed often enough to keep it clean and is kept at temperatures of 30 to 40° F. The fish are drained and packed. They must be sent to the freezer promptly, quick frozen and stored at 0 to —10° F. They must not be thawed and refrozen.

No emergency justifies the purchase of frozen fish without thorough examination. Undesirable fillets when thawed are bilgy, stale, discolored, gassy or putrified as evidenced by a pungent, sweetish odor.

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8. A report was made of detailed studies of the chemical composition and cellular elements of the blood of horses affected with equine periodic ophthalmia (recurrent iridocyclitis) by Capt. T. O. Roby, V.C., and Maj. T. C. Jones, V.C.

An important finding was a pronounced decrease in the glucose tolerance of affected animals. Significant deviations from normal were also found in the serum proteins. Relative lymphocytosis, with concurrent neutropenia, was the outstanding change in the blood picture in periodic ophthalmia.

Newer Drugs

The sulfa drugs can scarcely be classed as new to the veterinary field in this fast-moving therapeutic era, but new information concerning them is still being developed.

Clinical observations in the treatment of 122 cases of hemorrhagic septicemia and pneumonia in mature cattle with sulfamerazine were presented by J. L. McAuliff, Cortland, N. Y. The recovery rate was 95%.

Of 27 cases of pneumonia in young calves, 93% recovered with sulfamerazine therapy.

The author recommends the administration

weight, three times on the first day of treatment and 0.25 grain per pound body weight twice daily on the following two or three days. No toxic or other untoward manifestations were observed in any of the 149 animals receiving this dosage.

As a result of this study the author concluded:

1. Sulfamerazine is effective in smaller doses or less frequent doses than other sulfonamides commonly used by veterinarians.

2. In febrile conditions in cattle the response to sulfamerazine is prompt and often spectacular.

3. The results of these clinical observations indicate that hemorrhagic septicemia antiserum is unnecessary in the treatment of this disease.

Observations on the use of sulfamerazine and related sulfonamides in outbreaks of cecal coccidiosis in chickens over a three-year period were summarized by W. E. Swales, MacDonald College, Quebec.

Observations on experimentally induced *Eimeria tenella* infection demonstrated the therapeutic value of sulfamerazine in this condition and fully supported the reports of Horton-Smith and Taylor.*

In field tests sulfamerazine checked, effectively, outbreaks of coccidiosis in chicks when administered in the feed for three days, at the rate of 2gm per pound of mash; beginning at the first appearance of blood in the feces. Occasionally recidivation occurred, seven days after the drug was discontinued.

One-half the foregoing dosage given for a six-day period beginning when the chicks were first exposed to infection, protected them from infection and if they were kept on heavily contaminated floors resulted in immunity to coccidiosis by the sixth day. Under farm conditions the environmental contamination may not be sufficient to bring about this immunity and coccidiosis may develop later, in the flock as a result of reinfection.

Other sulfonamides were less dependable than sulfamerazine in controlled tests, but under farm conditions, sulfaguanidine and the sulfanilimido-pyrimidines were of definite value in checking outbreaks of coccidiosis in chickens.

W. T. S. Thorp, State College, Pa., also reported on the use of sulfamerazine in the treatment and prevention of coccidiosis in chickens. His experience comprised 10 experiments in which 1000, month-old chickens were used. The results were "encouraging."

*Vet. Med., 40:2, p. 173. 1945.

Sulfonamides in pullorum disease and paratyphoid infections of chicks and poults was the subject of a paper by B. S. Pomeroy, R. Fenstermacher and M. H. Roepke, St. Paul, Minn.

Sulfaguanidine, sulfasuxidine, sulfathalidine, sulfathiazole, sulfadiazine, sulfamerazine, sulfapyrazine, sulfamethazine and sulfaquinoxiline were tested, in various concentrations in the feed and water, in the therapy of pullorum disease.

Sulfathalidine and sulfasuxidine had little effect on the mortality from pullorum disease. Sulfathiazole possessed some value at a level of 1% in the feed. Sulfaguanidine was effective at the 5% level. Sulfaquinoxiline was effective but toxic and retarded growth. Sulfadiazine, sulfamerazine, sulfamethazine and sulfapyrazine were more effective in reducing mortality than the others. They were effective at 0.5% and 1% levels in the feed. The first three were also most efficient in the treatment of paratyphoid infections.

All the sulfa drugs studied retarded the growth of normal chicks and although the toxic effects disappeared in a few days after administration of the drug was discontinued, since it had to be given for a minimum of 10 days in the treatment of pullorum disease the interference with growth should be taken into account in evaluating it.

The sulfa drugs are more toxic to poults than to chicks and far less effective in the treatment of pullorum disease and paratyphoid infections.

The susceptibility of pathogenic bacteria of animal origin to penicillin was discussed by I. A. Merchant and R. A. Packer, Ames, Ia.

"The value of penicillin in the treatment of certain animal diseases has become apparent, but the fullest application of the drug is dependent upon knowledge concerning the susceptibility of various pathogenic bacteria to it. Early studies of penicillin demonstrated that the gram positive bacteria, as a group were more sensitive than gram negative species. Although some exceptions to this general rule have been found, it is still fundamental in therapeutic medicine.

"It is not assumed that the action of penicillin on bacteria is a sterilizing one. In fact, it has been shown that penicillin only inhibits cell division, while many metabolic activities are carried out at the usual rate. In determining the relative sensitivity of bacteria to penicillin by *in vitro* studies, technics commonly include those which show inhibition of growth on solid media or in fluid media. In our studies penicillin was incorporated in

blood agar in various Oxford units or fractions of an Oxford unit per cubic centimeter. Suspensions of the various bacteria were streaked upon the plate and inhibition of growth was determined after incubation for 48 hours. As a result of our studies, and those of other investigators, bacteria pathogenic to animals may be divided into three groups."

"Group 1, those susceptible to penicillin being inhibited by 0.125 O.U. or less per cc includes the pathogenic streptococci, *staphylococcus aureus, Corynebacterium pyrogenes, Erysipelothrix rhusiopathiae* and *Coryn. renalis.*

"Group 2 includes those moderately susceptible to penicillin, being inhibited by concentrations of 0.25 to 5.0 units per cc—Pasteurella, Brucella and Actinobacillus spp. and *B. anthracis.*

Group 3, those non-susceptible to penicillin (not inhibited by five units per cc) includes, *Malleomyces mallei, Escherichia coli,* Salmonella, Proteus and Alcaligenes spp. and a few strains of *Staph. aureus.*

"The discovery of resistant strains of bacteria in those species considered susceptible is of real significance. A number of strains of *Staph. aureus* were found to be resistant. Some of these strains were found to produce penicillinase, an enzymatic substance which destroys penicillin rapidly and which is produced by many of the known, non-susceptible species of bacteria. This substance, however, is not responsible for the resistance of all bacterial species. Penicillin resistance may be acquired as a result of the cultivation of susceptible species in gradually increasing concentrations of the drug and by prolonged therapy. Some strains are known to be resistant without previous contact with penicillin. Infections caused by such bacteria do not respond to therapy and explain some failures of the drug."

The results of tests of the effect of varying volumes of water as a vehicle for penicillin in the treatment of mastitis were reported by Alva C. Kelman, Madison, Wisc. Non-lactating cows, having altogether 300 infected quarters, were selected from 12 average dairy herds and divided into three groups having 100 infected quarters each. Each quarter was given a single infusion of 50,000 units of penicillin.

In one group of 100 quarters, the penicillin was dissolved in 10cc of distilled water; in the second group 100cc and in the third group 500cc of water was used. There was no significant difference in the percentage of recoveries in the three groups. Of those receiving a 10cc infusion, 53% were cured; of those receiving 100cc, 54% were cured, and of those receiving 500cc infusions, 50% were cured.

A paper on streptomycin in experimental infections and its possible use in veterinary therapeutics was presented by Alfred G. Karlson and William H. Feldman, Rochester, Minn.

The use of streptomycin in the treatment of the diseases of animals must be based upon an intensive study of dosage, absorption, rate of excretion and therapeutic efficacy in infections of the various species.

Streptomycin is absorbed and disseminated over the body readily from parenteral injections. Its elimination, *via* the urine is rapid. Injections must be made at short intervals to maintain a therapeutic level in the blood.

Streptomycin is active against a wide variety of microörganisms including gram negative bacteria.

"Streptomycin is effective in controlling experimental tuberculosis, brucellosis, leptospirosis, tularemia and Salmonella infections. In guinea pigs with well established tuberculosis it has been possible to effect a resolution and healing of the tuberculous process, and in some instances a reversal of a positive tuberculin test and apparent disappearance of the tubercle bacilli from the infected tissues.

Many microörganisms have the ability to acquire a resistance to streptomycin *in vitro* and *in vivo.*

The present status of streptomycin was discussed by Henry Welch and William A. Randall, Washington, D. C.

"Although streptomycin is still a scarce drug, many pharmaceutical manufacturers have, under construction, large plants for the production of it. In the near future ample supplies should be available."

The Food and Drug Administration tests every lot of streptomycin for potency, sterility, toxicity, moisture, purity and solubility.

Herbert L. Gilman and W. R. LeGrow, Ithaca, N. Y., obtained encouraging results from the prophylactic and therapeutic employment of streptomycin in guinea pigs artificially infected with *Brucella abortus.*

"While by the methods used, streptomycin failed to prevent or wholly overcome the infection, it had a marked bacteriostatic effect in some animals with few or no observable lesions. In contrast lesions were extensive in the untreated controls. It appears that other methods of administration of the drug, with more prolonged maintenance of therapeutic blood levels might have prevented or overcome the infection completely."

(To be continued)

The use of the Thomas arm splint has been discontinued in the Army by order of the Surgeon General because extensive tissue damage often resulted from the axillary pressure of the splint.

Research scientists of the Chas. Pfizer Co. report that streptomycin is more stable than penicillin. Streptomycin salts, containing less than 1% of water showed no loss in strength after a year on the laboratory shelf.

New provisions of the New Jersey law for the control of infectious diseases of animals became effective July 1, 1946. Except for cows sold for dairy purposes, all cattle weighing more than 200 pounds sold through a livestock auction market must be branded with an "S" which indicates they are for slaughter outlets only.

The newest treatment for acute glaucoma is based upon relief of the intense pain. Local anesthetics are injected behind the eyeball and pilocarpine and physostigmine are instilled into the conjunctival sac. The inflammation of the conjunctiva and sclera subsides, the eyeball softens and the vision, where not already too severely damaged, is improved.

Penicillin is the best and most economical treatment for mastitis due to Streptococcus infection and for mixed Streptococcus and Staphylococcus infection. Staphylococcus toxoid is the most economical in pure Staphylococcus infection, especially if more than one quarter is involved. The failures from Staphylococcus toxoid treatment should be given penicillin.—*Rofin Murphy, M.R.C.V.S. in the Vet. Rec.*

Close Mexican Border to Livestock Imports

Fear of hoof-and-mouth disease is believed to be responsible for an order establishing quarantine regulations covering importations of cattle from Mexico. The order states that after June 4 cattle may be brought across the border only if the importer applies for and receives a special permit from the Federal Bureau of Animal Industry. The cattle must then be held not less than 15 days in quarantine.

Each year approximately 250,000 head of cattle enter the United States at two points along the border. The quarantine, advocated by southwestern stockmen, also applies to sheep and swine.—*Nat'l Provisioner.*

Tick Repellent

"Stock 1037" is a new ointment which, when applied to the concha auriculae around the base of the horns and other favored locations of ticks on cattle, is said to protect the animals from tick infestation for periods up to six weeks. In much of the Gulf Coast area, ticks are the most common cause of screwworm infestation.

Stock 1037 contains 5% D.D.T., 47% rosin, 33% hercolyn (hydrogenated methyl abietate) and 15% dibutyl phthalate.

Penicillin and streptomycin will be useless as remedies against disease within five to 10 years. The reason these two great antibotics are destined for the scrap heap is, germs are devoloping resistance to these chemicals. The use of penicillin in lozenges, ointments and tablets, from which the patient gets only small quantities of the mold chemical, will hasten the day of its uselessness.—*Dr. Hans Molitor in Science News Letter.*

Myopia of the Fathers

Veterinary science is not synonymous with veterinary medicine. Veterinary science was never intended to be exclusively medical. The term in English-speaking countries was construed to mean only clinical veterinary medicine, *i.e.*, largely private practice among the sick, and an educational system based thereon, although the original purpose was the *production* and *use* of domestic animals with medical care as one means to those ends. Right from the start, our forebears lost themselves in the stuffy traditions of Galen—in the wilderness of theoretical medical doctrines, and there we remain, wrestling for a toehold on a field abandoned for others to develop for the food-conscious world.

'Twasn't smart for our primitive educators to turn their backs on the only foreseeable source of a reliable financial support—agriculture—and trust everything to high hats and long coats in the barnyard and stable as the stepping stone to lofty heights for the newborn profession. The less pretentious garb of the engineer in breeches and brogans would have been more symbolic of useful performance, meaning that when veterinary medicine discarded zoötechnics, it became but a fringe of veterinary science. Oh no, this has nothing to do with the white coats of the clinic and laboratory, nor the dress for dinner nor for golf. It is merely another way of saying that medicine is but a part of the broad veterinary field left behind and now stretches ahead. Shall we explore it or just carry on in the same old fashion?

Positions for Veterinary Poultry Inspectors

The Dressed Poultry Inspection Service of the United States Department of Agriculture is in need of qualified, graduate Veterinarians to fill vacancies in the force. Entrance salary is $3397.20 per year based upon a 40 hour, 5 day work week. Ordered overtime that may be performed in excess of this is compensated for. No written examination is required. Appointments are made on the basis of applications submitted. Opportunities for advancement are excellent. Phone, wire or write any of the offices listed below, giving full information as to availability, location preferences, etc.: Dr. H. A. Wechler, U. S. Custom House, 610 S. Canal St., Chicago; Dr. Roy E. Willie, P.O. Building, Omaha 2, Nebr.; Dr. J. R. Harney, U. S. Custom House, Philadelphia, Pa.; Dr. R. B. Mericle, U. S. Appraisers Bldg., 630 Sansome St., San Francisco, Calif.

* * * *

Army Institute of Pathology Open to Civilian Veterinarians

Army regulation No. 40-410 which sets down the organization and functions of the Army Institute of Pathology, provides that instruction will be given by the institute to "medical, dental, and veterinary officers. The facilities and material of the Army Institute of Pathology may be made available to qualified civilian physicians, dentists, veterinarians and other scientists for the purpose of pursuing studies in the various fields of pathology."

The institute is under the jurisdiction of the Office of The Surgeon General and is directed by a Medical Corps officer assisted by military and civilian personnel who form the professional, technical and clerical staffs. It comprises four departments: Department of Pathology, Army Medical Illustration Service, American Registry of Pathology for the National Research Council, and The Army Medical Museum.

The American Registry of Pathology for the National Research Council is sponsored and supported by the national medical, dental and veterinary associations.

In addition to the facilities for advanced study and research open to civilian veterinarians, the Army Institute of Pathology, through its Registry of Veterinary Pathology, offers diagnostic service in histopathology to veterinarians. Clinical data on each case, autopsy protocols and fixed tissues should be sent to the Director, Army Institute of Pathology, Washington 25, D. C. A report will be rendered without charge.

Fur Farming Work Transferred to U.S.D.A.

Breeders of fur animals raised in captivity who, for the last seven years, have looked to the Fish and Wildlife Service for assistance with their problems in breeding, nutrition, management, disease, and parasite control, will now find the work under the jurisdiction of the Bureau of Animal Industry, U. S. Department of Agriculture. The Federal Government's research relating to the domestic raising of fur animals was transferred from the Fish and Wildlife Service of the Department of Interior to the Department of Agriculture June 29, 1946, by act of Congress.

Included in the transfer is cooperative research in California, Maryland, New York, Pennsylvania, Washington, and Alaska.

Work in California is at Fontana and deals with current problems of rabbit producers. Work in Maryland is at two points—the Agricultural Research Center at Beltsville, where furs and fur fibers are studied in a laboratory known throughout the world for its contributions to animal fiber studies, and the Patuxent Research Refuge at Bowie.

The Fur Animal Experiment Station is located at Saratoga Springs, N. Y., where specially designed laboratory buildings and domestic fur-raising equipment permit studies of many different phases of fur-animal production. As at other Government stations, no live animals are sold. All the experimental stock is pelted as a means of measuring production methods, and proceeds from pelt sales are deposited in the United States Treasury.

The work in Pennsylvania is in cooperation with Swarthmore College and deals mainly with reproductive studies with silver foxes, minks, and martens. At Pullman, Wash., in cooperation with the State College, virus diseases of foxes and minks are studied, including nutritional deficiencies, which may cause susceptibility to distemper, and vaccines for the prevention and control of distemper.

At Petersburg, Alaska, in cooperation with the University of Alaska and the Alaska Game Commission, experiments are conducted with various species of fur animals, with attention to the utilization of feeds readily available in that territory.

Fur farmers and other interested persons who desire printed literature or other information on the raising of fur animals in captivity and domestic rabbits should now address the Bureau of Animal Industry, Washington 25, D. C. Information on the production, conservation, and utilization of fur animals in the wild can still be obtained from the U. S. Fish and Wildlife Service, Chicago 54, Illinois.

Research on Dog Foods and Dog Feeding*

By H. E. ROBINSON**
Chicago, Illinois

BY HEREDITY, the dog was, and still is, essentially a carnivorous animal. This has led many persons to the erroneous belief that meat and meat alone should be the sole satisfactory diet for this animal. This is simply a lack of knowledge and understanding as is the case in so many instances relating to good nutrition.

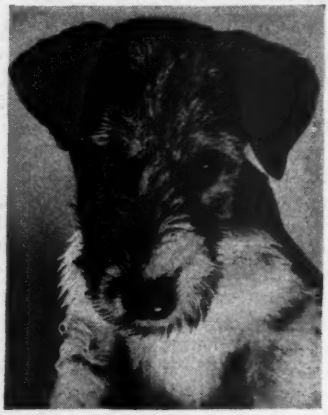
In the wild state, the dog, the wolf and the coyote are known to have balanced the muscular portion in the meat of their kill with the heart, liver, lungs and glands, even consuming the entire stomach contents of such small animals as the rabbit. The soft bones were used as a source of minerals, and the diet was ofttimes further balanced by certain kinds of fruits and grasses. Therefore, where the domesticated dog must, in most instances, depend upon his master for a proper diet, it is not a duplication of his natural diet to provide the dog with meat alone.

Acting upon such fundamental information and in the light of the recent advances in canine nutritional research it has been possible for interested food processors and manufacturers to produce well balanced canine food which will support the dog in excellent condition throughout all the functions of his entire life. Fortified with and applying such knowledge, well-balanced dog foods can be prepared from the proper combinations of meats and meat by-products, cereals, vegetables, minerals and vitamins. Unfortunately not all manufacturers who produce dog foods have the fundamental knowledge necessary to produce a nutritionally complete product, nor are they particularly concerned with the welfare of the dog. The dog and its nutritive requirements as well as the expectancy of the owner to obtain value comparable to his money expended must be considered above all by the manufacturer who produces a reliable product.

The average dog owner does not understand the extensive and continued program of canine research which must be kept behind an always reliable product. Some meats, meat trimmings, and the various glands and organs of the animal carcass are available for the formulation of dog foods. In most instances, these products are utilized in a dried form and then blended with other previously dried materials chosen as vitamin, mineral, carbohydrate and supplementary protein sources. In some cases these products have been combined at their normal moisture content and then the entire mixture dehydrated at relatively low temperatures. Pre-drying and subsequent blending has some disadvantage nutritionally, due to the higher temperatures involved in this process. Canned dog foods were almost always formulated from moist ingredients combined with pre-cooked cereals. The temperatures of further processing were intermediate between dry and dehydrated manufacture.

Meat—A Valuable Protein Source

Most dog food processors are aware of the high biological value of fresh meat and meat by-products. Many dog owners and, in some instances even veterinarians, have little knowledge of the nutritional virtues of these by-products and are inclined to believe them almost valueless when actually they are of superior protein quality and have a very high vitamin content. Properly processed soybean flours and meals have been a real boon to dog food manufacturers. These meals and flours serve as excellent supplements to the other proteins present. Ground cooked bones and bonemeals serve as readily available sources of calcium and phosphorus, but consideration must be given to supplying other minerals. Vitamins and vitamin concentrates are used in the formulation of dog foods to excellent advantage.



The wire-haired fox terrier was chosen to represent the terrier breeds

However, this broad supply of nutritious ingredients available for formulating dog foods which will properly support optimum nutrition for the dog, needs certain standards to assure that the feed meets the claims made for it.

*Presented at the annual convention of the American Feed Manufacturers Association, French Lick Springs, Ind., May 22, 1946.

**Assistant Director of Research, Swift & Co., Research Laboratories, Chicago.

A recent survey of dog food advertising has shown that most manufacturers begin their claims with "complete nutrition for the dog" and proceed to elaborate from that basis.

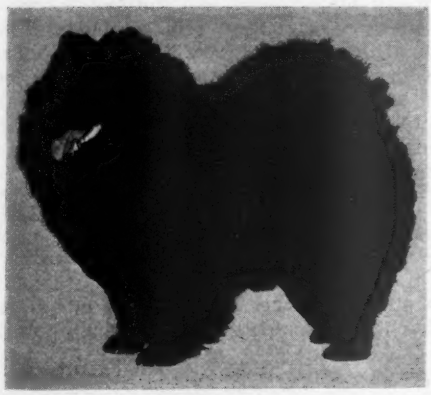
There are three major bases for the manufacture of a dog food which will truly support optimum nutrition for the dog. These are:

1. Intelligent selection of ingredients based on biological values and supplementary relationships.

2. Formulation to meet pre-determined physical and chemical standards for control of processing and uniform production.

3. Thorough biological testing to prove nutritional claims made for the food.

The ingredients available to dog food formulation have already been discussed. Protein, vitamin, mineral and fat values are established for each of them. Further consideration of quality as well as quantity of protein and of



The chow-chow was chosen to represent large, heavy coated dogs

protein interrelationships is essential. Mineral balance is as essential, particularly for calcium and phosphorus, as is the amount of minerals present. Vitamin fortification is easily accomplished for the better known vitamins. There are as yet many unknown factors which must be supplied by whole or concentrated foods.

No Universal Flavor Appeal Found

Formulation must also consider palatability, perhaps still the major problem in the practical feeding of dogs. Many flavor ingredients have been used, but extensive studies have failed to reveal one with universal dog appetite appeal.

There is enough evidence on the specific nutritive requirements of the dog to justify certain analytical standards for nutrient composition. The following guide table has been prepared on the basis of our own long-term studies in canine nutrition.

Nutrients per lb. or %	Food Sources
Proteins	
In moist diet—10% or above In dry diet—24% or more	Approximately 50% (moist basis) should come from meat, meat products, eggs, fish, or dried milk. This also insures B-complex vitamins and trace minerals.
Vitamins	
A.....2000 USP units D..... 300 USP units Thiamine ...800mcgm Riboflavin .....3.5mg Niacin 20mg	Fish liver oils, irradiated sterols or yeast, enough to provide unitage shown. 2% to 5% yellow vegetables or alfalfa leaf meal. 1% to 5% liver and/or kidneys and hearts.
Minerals	
Calcium—1.7% Phosphorus—1.3% Iron, Copper, Manganese, other minerals in small amount. The use of iodine salts may be indicated.	1% to 3% bone—preferably cooked and ground. Adequate animal source proteins will provide other minerals. Cereals provide minerals.
Fats	
3% to 5% (moist feeding basis) to provide energy and essential fatty acids.	Use some moderately fat meat. Add fat if using meat meals or all dry ingredients.
Carbohydrates	
May be best to use on two to one basis of protein plus fat.	Whole grains, finely ground. Grain by-products. Best if cooked or properly heat treated.

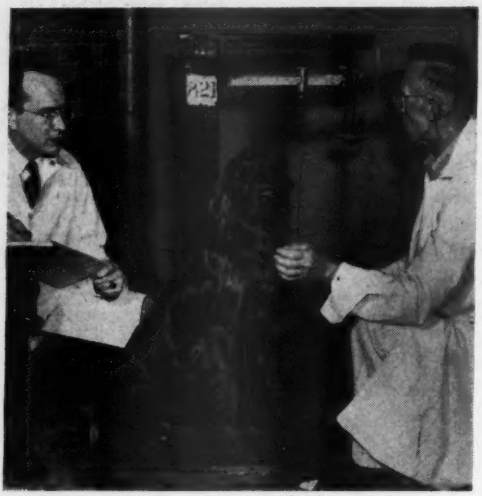
It might be well now to consider the tests that can be made to determine whether a dog food is truly well balanced and will be certain to support health and well being in a dog throughout his life. Such tests are primarily biological and must be so considered.

Tests Begin with Small Animal

One of the first tests is usually that of feeding the dog food to a smaller animal to save time and to allow more tests than could be run with the dog. In this type of study, the dog food in question is fed as an exclusive diet to the small animal for a certain number of weeks as a growth period and then a study is made of mating and reproduction and the growth of the young from the first animal down on through at least three generations. If the performance has been entirely satisfactory from all standpoints during this period, it is relatively safe to assume that the food may be satisfactory for a dog.

At certain times, shorter tests may be run such as for the growth period alone, or for the purpose of determining how much of any particular vitamin the dog food may contain, or how well the protein that is in the food will support growth and maintenance. Such tests usually are used during the formulation of the product and as a "check up" from time to time to make certain that the quality of

the product is being maintained. The final test of any food of course is to feed it to the animal for which it is intended. Only such final proof can establish the true value of a dog food through all life processes.



Periodic weight checks are taken to determine growth or maintenance of weight. A laboratory assistant maintains continuous records on each dog in order to establish a norm by breeds. Examination is also made for general health condition by staff veterinarian

In our own laboratories the original work on our dog food covered a period of about 12 years, prior to the time we made our present generation studies on dogs. During this period, hundreds of combinations of meat, cereals, vegetables, minerals, and vitamin products were worked out and fed to smaller animals and dogs for short feeding periods. When it became reasonable to believe that the final formula upon which we had decided was satisfactory in every respect, we set about to prove it on dogs. Such a study, of course, entailed a great many problems. The actual feeding program was quite simple, merely supplying adequate amounts of the dog food and water. No medicine, no other supplementary food of any kind at any time, needed to be or has ever been fed. Thus, for 10 generations, through growth, pregnancy and lactation these dogs have had only this dog food with water always available. To outline some of the test problems and the solutions made:

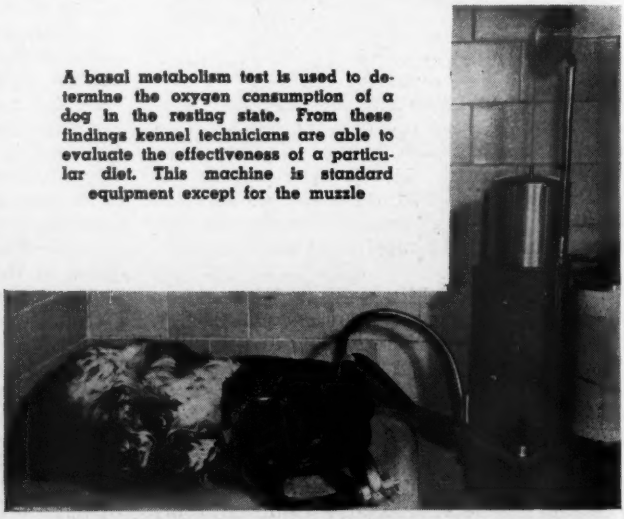
1. What Type of Dog Should Be Used?

It was finally decided that a pedigreed animal should be used because it is possible with such animals to determine the family history for many generations and thereby know what to expect in the way of growth, appearance, length of life, number of puppies produced, etc. It was decided finally that the wire-haired fox terrier would be an excellent representative of terrier breeds and was an extremely popular dog. The cocker spaniel was selected as representative of the spaniel type of dog and it also was a favorite breed. For a third dog, the chow-chow was selected as representing a 40 to 60 pound dog with a very heavy coat and a dog that was reputedly somewhat difficult to maintain in excellent condition. Our first step then was to obtain representative specimens of these three breeds from well recognized kennels; in 1934, therefore, we obtained puppies, both male and female, two to three months of age, representing each of these three breeds. They were put upon a rigid feeding program of nothing but the dog food and water and have been so maintained in the 12 years that have elapsed since the study first started. A fourth breed, Irish setters, added in 1940, are now in the third generation.

2. Determining Type of Kennel Construction

After visiting prominent kennels, animal hospitals and civic dog centers in various parts of the country, it was eventually decided that an all steel kennel, individually and directly attached to a drainage system would be most satisfactory. We therefore set up 30 of these kennels in a special housing room. Sanitation was thus made relatively simple as the kennels

A basal metabolism test is used to determine the oxygen consumption of a dog in the resting state. From these findings kennel technicians are able to evaluate the effectiveness of a particular diet. This machine is standard equipment except for the muzzle



can be washed thoroughly and sterilized every day by means of hot water and high pressure steam. It seemed more comparable to the average dog's life to provide runs. This was secured through outside kennels where the dogs ran in the daytime and at night were kept in kennels.

3. Selecting a Long-Range Feeding Program

It was decided that adult dogs should be fed once a day, in the evening, water being available to the animals at all times. Puppies were to be kept with the mothers until six weeks of age, then weaned directly to the dog food with no other supplement, feedings for these puppies to be started at five times per day at six weeks and cut down to three times a day at three months; then decreased to one feeding daily at one year of age.

4. Factors to Consider in Mating

Breeding stock was mated the first time each female came in season inasmuch as it is a more severe test of the food to have a young female raising puppies at the same time that she is still growing.

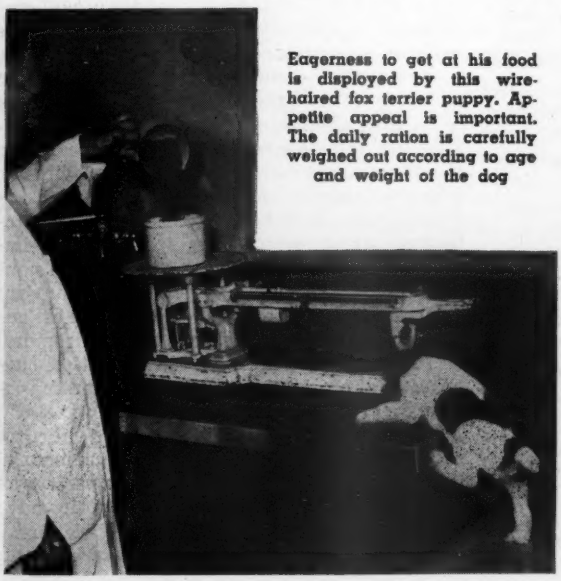
The first litter of puppies was born in the kennels on December 15, 1934, from a nine-month-old, chow-chow female. She raised six puppies without difficulty. In three months she gained 15 pounds.

5. Extensive Records Kept in the Kennels

The amount of food eaten by each dog is recorded for every day of the year. Adult dogs are weighed twice monthly and puppies every week. Complete growth records are kept.

The cocker spaniel was selected as representative of the spaniel type of dog and, in addition, is the most popular breed in this country at the present time

This program has been followed throughout the generations test on our dog food which have now been continued through the tenth generation of puppies. From the first generation of puppies which were originally brought into the laboratory, other puppies were selected from their offspring and so on down the line. Starting with eight original dogs in 1934 and adding only a few males in the past years to bring in outside blood, there have been raised, to date in our kennels, over 500 dogs. There are present at all times about 40 dogs in the stock colony. Graduate veterinarians and biochemists continually inspect the dogs for any evidence of deficiency in growth, reproduction, lactation, or mineral or vitamin failures.



Eagerness to get at his food is displayed by this wire-haired fox terrier puppy. Appetite appeal is important. The daily ration is carefully weighed out according to age and weight of the dog

Since similar programs have been carried out by many dog food manufacturers it is obvious that the attention which the dog is receiving today from a nutritional standpoint is even more profound than that of mankind. Ten generations of people would require a minimum of 200 years, thus with the dogs we have learned as much from a controlled well balanced feeding standpoint as could be learned with human beings under similar circumstances if such practices were continued for several centuries. It is probable that in the very near future we shall know a great deal more about the actual nutritional requirements and nutritional performance of the dog than we do of his master. If the dog food industry fully meets the obligations which it has assumed in its advertising, we can now assure a continuously healthy, long, and happy life for man's best friend, the dog.

Preliminary Report on the Propagation of Hog Cholera Virus in Vitro

By WILLIAM H. BOYNTON*
Department of Veterinary Science, University of California, Berkeley, California

ARTIFICIAL cultivation of hog cholera virus has been accomplished by a method differing from those reported to be successful by Hecke[1] and Ten Broeck.[2] This method is a modification of Simms and Sanders' serum ultrafiltrate method[3] of tissue culture and propagation of viruses. A medium containing commercially prepared bovine serum ultrafiltrate was first used in two trials but the virus failed to survive the second transfer in either attempt. To satisfy, if possible, the requirements of a virus specific for pigs alone, serum ultrafiltrate from a non-cholera immune pig was substituted for the bovine ultrafiltrate and was obtained by means of collodion sacs prepared according to the method used by Greenberg and Gunther[4] in their work on ultrafiltration. For the medium, 25cc of the ultrafiltrate were diluted with 80cc of the physiologic solution employed by Simms and Sanders. This serum ultrafiltrate medium was sterilized by filtration through a Corning glass filter with fritted disc and was distributed in 15cc amounts into large test tubes measuring 200 x 25mm. The pH of the medium was adjusted with 10% carbon dioxide to 7.4 to 7.5, and the tubes were stoppered with tightly-fitting No. 5 stoppers. Occasionally, before inoculation, the pH had to be re-adjusted; it was lowered by the addition of carbon dioxide and raised by replacing the rubber stoppers with cotton until the desired point was reached. The medium was very seldom readjusted after inoculation. For the living tissue, red bone marrow from a pig susceptible to cholera was selected as a component suitable to foster multiplication of the virus and unlikely to be contaminated. Approximately two grams of red marrow was collected aseptically in a Petri dish and about 8cc of the ultrafiltrate medium were added. A curved scissors was used to mince the tissue finely in the medium. The calcareous tissue was discarded and about six drops of the cellular suspension so obtained were added to each tube of medium by means of a 10cc pipette of sufficiently large caliber at the tip to permit flow of the tissue suspension. The tubes were then incubated overnight at 37° C. to check sterility. The original inoculum was one drop of a suspension of bone marrow from a cholera-infected pig; thereafter, 0.5cc of culture fluid was the inoculum used. The inoculated tubes were incubated at 37° C. for three days and kept at room temperature for two more days. The culture fluid in the tubes was then pooled and stored in the refrigerator to be used later for viability tests and for inoculation of the next culture transfer. Occasionally, bacterial contaminations appeared and the virus cultures were discarded; further passages were then made from earlier transfers.

A second series was prepared and carried along in the manner just described, except that to each culture tube containing 15cc of serum ultrafiltrate medium, 1cc of cysteine solution equivalent to 0.05mg of the cysteine compound was added to determine whether or not the presence of cysteine might enhance the virus.

Cultures of both series, with and without cysteine, have now been propagated through the 24th generation. Viability has been established in each generation by inoculation of each of two pigs with 2cc of culture and subsequent observation of temperature reactions, typical clinical symptoms and lesions at autopsy, and of the so-called inclusion bodies found by the gall bladder smear method[5] in the mucoid cells of the gall bladder of cholera-infected pigs. A titration experiment on the seventh generation of the first series; that is, without cysteine, showed that 2cc of a dilution of 1×10^{-9}, the highest tested, proved infective to each of the two pigs inoculated. The presence of cysteine has, in general, appeared to stimulate the virulence of cultivated virus to a slight degree.

For three of the 24 generations here reported, serum ultrafiltrate from cholera-immune pigs was used in place of that from non-immune pigs and the potency of the virus cultures thus grown seemed to remain undiminished to any great extent. The removal of the immune bodies by ultrafiltration suggests the practicability of using serum obtained directly from the abattoir.

Vaccines have been produced from the virus cultures through the action of various modifying agents. In two trials, four pigs each were given vaccines in which the cultured virus was modified by irradiation with ultraviolet light. Three of the four in each trial survived a later

*The author gratefully acknowledges the assistance of: Gladys M. Woods, Department of Veterinary Science, University of California, Berkeley, Calif.; F. W. Wood, N. H. Casselberry, Wesley W. Walker, Dwight C. Birch, Betty Wernli Magruder, Agnes Benedek, and Fred Osborne, Cutter Laboratories, Berkeley, Calif.

immunity test with unmodified hog cholera virus blood. Of the three controls used in each trial, two died of cholera in one case and all three in the other. Trials of vaccines from

In two trials some pigs were given vaccines in which the cultured virus was modified by irradiation and ultra-violet light

virus cultures modified by eucalyptol, formalin, and crystal violet have been less successful.

Continued experiments on propagation of hog cholera virus and on vaccines prepared from virus cultures are in progress and a more detailed report on this work will be made at some future time.

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Diseases of Young Pigs*

The loss of suckling pigs is high, much too high. That much we know, although we don't know how great the loss actually is. There are many estimates of the number and percentage lost, but too few facts on morbidity and mortality in the whole field of veterinary vital statistics. For several years I have been collecting information as to the loss of pigs between farrowing and weaning on farms in the cornbelt. My information is to the effect that it is between 25 and 30%. I am satisfied that estimate, or guess if you prefer, is not far off. It varies of course from community to community and from year to year in the same community. In an accurate survey of two townships in Minnesota it was found that only 73% of the pigs that were farrowed reached market age.

On one farm where I investigated the diseases of the young pigs the loss was approximately 50%. On another large farm in the southern part of the state where I studied the disease situation in the pigs, the loss in 26 litters farrowed in a single month was 80%. Any way one looks at it, the death of suckling pigs represents an enormous economic loss and something should be done about it. Something is being done about it in Indiana, Illinois, California and Minnesota and at the Bureau station at Beltsville. Research workers at each of these stations, although all are working on what appears to be the same disease problem, call this most important disease of young pigs by a different name. In Illinois it was first called baby pig disease and now hypoglycemia. In California they call it three-day pig disease. At Beltsville it is uremia. In Minnesota we have called it alimentary toxemia and in Indiana they just say sick pigs. All are apparently dealing with the same clinical syndrome and although considerable has been learned as to what makes pigs die, less has been learned about what to do about it. That must come later.

In Illinois they found that though the normal blood sugar for a pig is from 70 to 100mg per 100cc of blood, in this disease of young pigs, the sugar may be as low as 20mg per 100cc. The normal blood urea level may be taken as 11mg per 100cc of blood, but at Beltsville it was found that, in sick pigs, the urea ranged up to 100 to 200 and in some instances even 300mg per 100cc or some 30 times the normal amount.

For ages it has been observed that certain women in Oriental countries cannot raise their babies if they nurse them. They are referred to as having "poison milk." Recent scientific investigation has confirmed the observation and although the cause has not been determined there are indications that the trouble is nutritional deficiency of the mothers. Of course everyone has heard of the "acid" milk some bitches are supposed to produce and to which the dog breeder attributes the loss of so many puppies. Occasional swine raisers too speak of sows giving poison milk and attribute the loss of many whole litters of pigs to that cause. Thus it will be seen that there is a great amount of observation and folklore to the effect that sometimes a mother's milk is not suited to her young.

I mention this because in our investigation in Minnesota, which as I have already said is far from complete, we have some indications

*Notes from an address, by Dr. H. C. H. Kernkamp, St. Paul, Minn., on Diseases of Nursing Pigs, at the 21st Annual Conference for Veterinarians, School of Veterinary Medicine, Alabama Polytechnic Institute, Auburn, February 26, 27 and 28, 1946.

that this pig disease is due to characteristics of the sow's milk. Even the symptoms point in this direction. The first symptom noted is a failure to eat. The pigs are hungry, desperately hungry. They take hold of the teat but don't suckle or suckle but feebly. Later a profuse diarrhea and extreme lassitude ensues. Within 24 hours dehydration is marked and the hair coat shaggy. Then comes coma and early death.

The most characteristic lesion is enlargement of the adrenals and great friability of these organs. These glands are, normally, about one-half inch by one-fourth inch in size in young pigs. In pigs dead of this ailment the dimensions are double those of the normal gland. In many cases the liver is fatty and light colored. The mesenteric blood vessels are highly engorged.

Of course young pigs are lost from many causes other than the ailment I have been discussing but in most cases we know at least something to do about them. Agalactia in sows is a cause of some loss in pigs. If given early enough an injection of posterior pituitrin usually brings a good flow of milk. If a flow of milk cannot be induced the pigs can be fed artificially with success if the owner is willing to go to the trouble to feed them properly. In preparing a formula it must not be forgotten that sow's milk contains from 7% to 22% of fat and that cream should be mixed with cow's milk to increase the fat content. Assuming we have a 4% cow's milk and want to prepare 500cc for pig feeding. If we use 375cc of milk and 125cc of 28% cream the whole will contain 10% of fat which is perhaps about as low in fat content as we should use. Young pigs can be induced to drink milk from a shallow pan readily. Artificial feeding must be commenced promptly when the natural source fails and continued regularly every three hours day and night for the first few days. Young pigs are quite susceptible to effects of starvation, particularly if they are not kept warm. Twenty-four hours without food during the first few days of life seals their fate and a considerably shorter period can injure them materially.

Pig anemia is responsible for the loss of a good many pigs which are farrowed in the winter time. It can be entirely prevented by allowing the pigs access to soil that has been sprayed lightly with a solution of iron sulfate. In winter pigs, kept indoors, this access to soil should begin at three days of age. It is a mistake to wait till some of the pigs are showing symptoms of anemia before taking measures to prevent it. Even if an anemic pig does not die of anemia its resistance to all diseases is lowered by the attack and it becomes a fit subject for bull nose, dry mouth, diarrheas, etc. Furthermore anemic pigs cannot be immunized against hog cholera and may be lost to that disease.

* * * *

Inadequate feeding is still the greatest cause of low production in our dairy herds. Many so-called deficiency diseases disappear when animals are fed up to their nutrient requirements.—W. H. Fitch, Chief, Division of Dairy Husbandry, University of Minnesota.

* * * *

Amazing progress has been made in the field of meat production, studies of which have revealed that costs of gains in meat animals, percentage yield of popular cuts, tenderness of the meat and other factors may all be influenced by breeding.—R. C. Pollock, Mgr., National Livestock and Meat Board.

* * * *

The rumen, largest of the digestive reservoirs of the ruminant, is no longer studied only as a stopping place for aliment on its way through the digestive and absorptive processes, nor are its subsidiary functions limited to the fabrication of B vitamins. It is instrumental in the production of vitamin K and its bacterial and protozoan flora is engaged in transforming nonprotein nitrogen such as urea and ammonium compounds into utilizable proteins. Grossly speaking, the ruminant, because of its prosaic paunch, is capable of energizing roughage of plants that would be lost to any other phylum of the animal kingdom.

* * * *

Penicillin Therapy in Tetanus

Captain Lichty[1] treated a four-year-old, native gelding on Okinawa, which developed tetanus 10 days after receiving a puncture wound three inches below the stifle. The animal, weighing 650 pounds, was given 100,000 units of penicillin intramuscularly, every three hours until 30 doses had been given; then 50,000 units at the same interval until a total of 4,100,000 units had been administered. Various sedatives were given intravenously and the animal was fed *via* the stomach tube. So far as could be determined the course of the disease, ending fatally, was not influenced by the penicillin.

The author states that a Naval officer treated 45 cases of tetanus in native Okinawans, one-third of them with penicillin, and reported no benefit was apparent from the administration of penicillin.

[1] Lichty, Dwight L., Capt. V. C. Penicillin therapy in a fatal case of equine tetanus. The *Bul.*, U. S. Army Medical Dept. 5:4, p. 486. 1946.

Army Food Inspection in the China-Burma-India Theater[1]

By GEORGE D. LODER, Major, V.C.
Portland, Oregon

WHEN leaving America for India in 1942, I tried to imagine what my assignment would be like; what I would do on the opposite side of the earth in that strange and fascinating land of odd customs and religious creeds? How may one go about the daily task of food inspection under conditions so different from those at home? I shall attempt to impart some of my experiences and observations, but no technical dissertation.

a. Mission

Inspection of all foods, of which products of animal origin form a considerable part, is prescribed by AR 40-2150.

It should be remembered that in remote theatres of war, certain fresh foods of animal origin are not received as they are at various camps and posts in the United States. Unless these items can be obtained from an approved source, it is the duty of the Veterinary Corps to make the necessary prepurchase inspections. In other words, we function as the Army's provisioners or commercial packers. However, do not lose sight of the fact that the Veterinary Corps *acts simply as an inspection agency and is advisory* to the quartermaster subsistence officer, who handles all bids, bid tenders, contracts and contractors. It should be kept in mind that the following description of food inspection refers only to the procedures in the CBI Theater during the late war.

b. Classes of Inspection Conducted

Class 1. Ante mortem Inspection.—This comprises an examination of meat animals, including poultry, prior to slaughter to determine condition, type, quality and freedom from clinical symptoms of disease.

Class 2. Post-mortem Inspection.—This includes a detailed examination of the internal organs of all animals and birds slaughtered for food purposes, for the discovery of any pathological conditions or diseases not visible on ante mortem inspection. The examination is made in accordance with regulations governing the meat inspection of the United States Department of Agriculture, Order 211, Revised, and such additional directives as may be issued by the Surgeon General. In the India-Burma-China theater these two classes of inspection were conducted upon beef, mutton and poultry.

Class 3. Inspection on Delivery at Purchase.—This inspection includes fish, eggs and butter. Fish are inspected at delivery and at issue for condition and soundness and proper packing (frozen or thoroughly iced).

Inspection of eggs included complete, 100% candling of all eggs received. There is great difficulty in obtaining shell eggs at certain times of the year—May-September—in India, the Near East and in many parts of Africa. During these months, it is just about impossible, due to intense heat and the great distances they must be transported, to obtain *edible* eggs. When transportation is by oxcart, 200 miles becomes a great distance requiring the greater part of a month to traverse. The average daily requirement at the station where I was located (Northern India) was 1500 dozen, frequently we were able to accept only 25 to 50 dozen daily, because of the unsound conditions. One could see more insanitary and unsound conditions in 10 minutes spent in our candling room than one would see in the average produce establishment in America in a year. The native contractor assumes that all eggs are "theek hai Sahib," meaning "O.K.," and it is difficult to convince him to the contrary.

Butter was obtained from an approved source. The only butter available was from milk of the water buffalo, a pasteurized product, packed in seven-pound tins manufactured in a modern establishment with New Zealand equipment. It was further inspected upon delivery. Poor shipping conditions and lack of refrigeration facilities from manufacturer to bases and units presented difficulties. Normally, of course, there are various other dairy products to inspect but at this station we could obtain no fresh fluid milk or cheese. Evaporated and powdered milk were shipped from home—when we had any.

Class 4. Inspection at any Receipt Except Purchase. This inspection includes sanitary supervision of the manufacture of ice cream as prescribed by AR 40-2150. This inspection took place at the QM Detachment. The ice cream was manufactured from Government-owned materials, by military personnel, in a Government-owned and operated plant, under the supervision of the Station Veterinarian. This inspection also includes commissary sup-

[1] Parts of this discussion appeared in the Texas Veterinary Bulletin.

plies when they are transferred from one organization to another.

Class 5. Inspection Prior to Shipment.—This inspection was conducted at the Subsistence Warehouse.

Class 6. Inspection at Issue or Sale.—This is a reinspection. It comprised examination for local consumption either by troops or by persons authorized to make purchases of subsistence supplies.

Class 7. Inspection in Storage.—This comprises a periodical reinspection of various foods in storage that may have become damaged in transit, aboard cargo vessels or while

Left to right: Murad Mushida "Joe," the author and Roque de Costa, the Major's driver. Behind: "Popeye," Striker who looks after "Major Sahib"

in storage, mostly tinned foods. Any cases, boxes or containers showing any indication of damage, leakage or deterioration were segregated, opened and inspected for condition by a crew of laborers under supervision of enlisted personnel of the Veterinary Detachment. Such items as were considered unsound and unfit for human consumption were disposed of in accordance with local requirements by incineration at municipal dumps and a certificate by a veterinary officer covering the quantity so rejected was furnished to the subsistence officer.

All soiled cans, found to be sound on reinspection, were washed and cleaned and repacked into case lots. Odd cans and broken lots were set aside for local issue, in the "loose can" section.

The method used to incinerate condemned cans was to take a truck load of cans to the dump followed by a truck containing old and damaged paper boxes and wooden boxes to facilitate burning. Also, it is necessary to use about five gallons of old crankcase oil and gasoline mixed. This is poured over and about the completed pile of boxes and cans. Each can is bashed in as the truck is unloaded by coolies standing at either side of the tail gate and using two hatchets with handles six feet long. Caution must be used to see that all products are burned and to keep beggars and the curious away.

c. Post-Mortem Inspection for Beef, Mutton and Poultry

These three items were not received at our base from overseas or any other approved source. It was therefore necessary to procure them locally and to write up our own specifications for abattoirs to be constructed for the slaughter of cattle, sheep and poultry.

For reasons of religion the beef and mutton contractors, and also the butchers, were Mohammedans. An occasional Hindu contracted to supply poultry, but in most instances poultry contractors, too, were Moslems as were the workmen in all instances.

In India it is important to adjust ones self to circumstances and observe religious customs and requirements in the matter of killing of animals, including poultry, which is similar to Kosher style as we know it in America.

I found the native butchers to be fairly adept and proficient with the implements of their trade. However, they were accustomed to doing things with little or no consideration for sanitation and were most rough in handling animals and dressing carcasses.

When we first began slaughter, the task seemed hopeless. Everybody was in conflict and everything in confusion. Native butchers and coolie sweepers shouted and screamed at one another and all at the same time. We were getting no place fast.

I observed these conditions for a while and concluded that here we were in a strange land; that we had to produce certain products under trying conditions of heat and filth, if the troops of the command were to be fed. It would be difficult; the situation was very strange to us and we no doubt, were oddities to the natives.

I called aside the contractor who spoke English and was a man of significance in the community. He had traveled in England, America and Australia. I also called the army enlisted personnel into this huddle and told them definitely what I wanted.

The contractor called his crew together and explained in Hindustani accompanied by considerable gesticulation what we wanted. From then, we began to operate in the manner in which we should, improving as we went along. There was little confusion and shouting. Our hourly production was doubled and all employees kept clean and did their particular job in a satisfactory manner. However, one must *show* a coolie what is wanted.

Beef.—Our set-up was an eight-bed affair. Animals, that met specifications, were selected from the compound eight at a time. They were led onto the killing floor on a line by coolies. Four animals on each side of the room or one to each bed. Then, starting at bed number one, the animals were cast and the four feet drawn together and tied. Each animal was then dragged toward the center drain for bleeding; thus eliminating unnecessary soiling of the floor.

The actual killing was done in accordance with Mohammedan custom. The head was extended and turned and the throat severed, the men at the same time uttering a prayer to Allah. This procedure was continued until the run of eight cattle were dead.

The prayer at the kill—"Bismallah, hokbah, Allah hokbah." Hats must be worn, the animal must be on its left side. Manpower alone is used at this stage of slaughtering, in fact throughout the whole process. Note the tile side wall, smooth floor, floor drain, and barefoot (always) butchers

As each animal bleeds out and expires, coolies with buckets of water and brooms wash the floor and then drag the carcass back to the bed for flooring, skinning, half hoist, full hoist, evisceration, splitting, inspection, washing and quartering, and for weighing, if acceptable after routine post-mortem inspection. This inspection consists of routine procedure: incision of the cervical glands, masseter muscles and the bronchial and medistinal glands; observation and incision of the heart and lungs, the portal glands and liver, observation of the carcass, all as directed in AR 40-2150.

After weighing, the quarters are hung in a screened room, the beef being lugged by coolies in *clean white* clothing of a readily washable nature. Here, the carcasses are further washed and any remaining bruises are removed. Each quarter is branded with the VC inspection stamp. The quarters are then *hung* in clean refrigerator trucks and taken to our cold storage depot for chilling, possible freezing and issue.

A small amount of beef was boned in keeping with commercial practice, frozen and flown by air to some small isolated units. These units received poultry, ice cream and fresh eggs by the same means. Before the advent of our production efforts, they had existed on type "C" ration entirely. I was informed they, at least, appreciated our existence.

The pathological conditions found upon post-mortem examination sufficient to justify rejection of a carcass may be of interest. All in all, the incidence of various diseases, such as tuberculosis was surprisingly low. About the worst offender was cysticercosis, then echinococcosis, tuberculosis, empyema, pyemia and pseudoleucemia, in that order. I didn't place too much significance upon echinococcus if the carcass was well nourished. Rejection of livers because of parasitic infestation exceeded 90%. In India, we didn't pass or condemn a carcass or a part as we do in America. We accepted or rejected. Anything rejected reverted to the contractor who disposed of it at the bazaar.

Mutton.—This commodity was issued once weekly as an item of subsistence. It required about 450 acceptable carcasses of 30 to 40 pounds average for each issue.

In the compound, the entire band of sheep offered for sale was passed through a chute for the purpose of grading for condition and observation for manifestation of symptoms of disease. Those accepted were segregated. This method was a decided improvement over previous methods used. It was a time saver, eliminated confusion and repeated presentation of animals that had been rejected previously because of being under grade.

Forty sheep were killed at a time, simply by casting them and severing the throat in accordance with the custom. They were bled at the central drain. Carcasses were then removed to the rear of the floor from which point the usual routine dressing continued; hanging from hooks, washing, evisceration, inspection, further washing, branding with the VC stamp, weighing, refrigeration and issue completed the job.

Routine post-mortem findings were rather insignificant; the usual respiratory conditions, empyema and pyemia being the chief reasons for rejection.

Mutton had little or no appeal to troops of the command. It was difficult to obtain and, after a time, was discontinued upon recommendation of the writer.

Poultry.—We procured, dressed, packed and inspected from 25 thousand to 30 thousand birds a month. Poultry was slaughtered in a separate abattoir. All birds were selected on a Class 1 inspection, with a high rate of rejection. Over a period of several months, 157,490 were passed and 51,972 were rejected for not conforming to "type class or grade" and 7376 for being insanitary or unsound. In India one does not find poultry of quality as we know it in this country. This emphasizes the importance of inspection and grading.

The coolie butchers at the poultry abattoirs were employed by the Government Civilian Personnel Section, at the usual wage of one rupee (30c) per day and were under complete supervision of the veterinary enlisted personnel. This abattoir, like the one where cattle and sheep were slaughtered, was built by the army according to specifications prepared by the Station Veterinarian.

Such equipment as knives, tables, charcoal and charcoal burners for heating water, GI cans, packing paper and poultry cases, scales, etc., were procured by requisition; all such supplies being furnished by the Army.

Birds were selected, hung seven to a string, stuck at a bleeding rail, scalded, picked, washed and cleaned on large tables, around which the coolies *stood* to work. From here, the birds passed to another large table where evisceration and routine inspection took place.

Next, the birds passed through clean water and any further polishing or cleaning took place. After grading and final inspection they were packed in clean crates for cold storage. They were packed 14 to 20 to the crate.

The crates were constructed by base utilities according to a design which I prepared. They were built with full bottoms and open slat sides and no tops. They were sufficiently heavy to stand repeated handling. Wrapping paper was used over the bottoms of crates, allowing ends long enough to fold over the completed pack. All poultry was pre-cooled, 24 to 48 hours, and usually frozen or back packed. It was then issued, arriving at messes in a highly satisfactory condition. All crates were returned to the subsistence warehouse, washed and sun dried, stacked for re-use again and again.

When I arrived at this station one of the first things I noticed was that all the natives would squat at whatever they were doing, and seemed to be more interested in squatting than getting on with the job. I took steps at once to have tables built, with large holes cut in the center under which GI cans were placed for receiving feathers, feet, heads and offal. This beat squatting and working on the floor.

Fortunately, I was able to secure from sal-

Native market. Needless to say such were "off limits" for purchase of supplies for military personnel

vage, odds and ends of fatigue clothing and some old worn out shoes for these coolies which afforded them protection and gave opportunity for some sort of work clothing which was readily washable. Effort by any officer to show these poor wretched people a better way to do a job garners a great deal of respect for that individual and many salaams when he comes around to look things over. Properly handled, the native coolie is quite loyal.

Pork.—One can just about forget the production of pork in India at this time. We were located in a province which was largely Mohammedan. To them, pork is unthinkable and untouchable. In addition, live hogs were not available locally. If it had been possible to get them shipped in, it would have necessitated the construction of a separate abattoir, the employment of Hindu or Christian butchers and such are not available except in northern India. With the exception of the extreme northern part of India, in the mountainous cool hill stations, pork is not packed commercially in India. It is packed in these stations by only a few small European outfits.

When I arrived at Base No. I, about the first thing that confronted me, was the inspection of some native Indian bacon. This so-called

bacon arrived in a dirty native donkey cart, exposed to the elements and myriad insects and was in a horrid state. It had been shipped from up country, no inspection, probably cold slaughtered (they will use anything). The product was undercured and smoked, soft, oily, sexy, filthy and the average weight of a piece was 5 1¾ pounds. The army had made a local purchase of this product without first consulting the veterinary officer.

Needless to say, the product was rejected for good and sufficient reasons, but this didn't please or coincide with the ideas of a certain other comrade in arms. However, as the inspecting officer, I stood on AR 40-2150 and as a result the troops soon thereafter received American tinned bacon from the stores of our allies on reverse lend-lease. As for all pork and pork products as far as India is concerned, unless one can get it shipped in from America or other approved sources, one had best abandon the idea of having it. The British Army, which has been in India for nearly 200 years, makes no attempt to procure pork from Indian sources. It establishes army farms where swine are bred, raised, fattened and slaughtered for the use of their troops. These swine are fed upon cooked garbage from the soldier's mess and grain and pasture raised on the farms. It seems the only way to have fresh pork in India.

Native Sind cattle on line for inspection before purchase. All shown were accepted and dressed out well, except the fourth animal from the left, the carcass of which was rejected, on post-mortem examination, because of cysticercosis. Parasitism is very common among Indian cattle. Ninety per cent of the livers of slaughtered cattle were rejected because of parasitic invasion

Milk.—There are a few places and installations in India that have pasteurized fluid milk available. At our base, we had none, due to lack of pasteurization facilities. Those places that had fluid milk obtained it from dairy farms under British Army control. I visited one such place at Poona and one other large commercial dairy outside Delhi which was under European management. Both were operated along modern lines with approved equipment. The dairy herds were made up of Holstein-Friesian and selected native stock crosses.

There was one dairy herd near our base which was a possible source of milk. The milkhouse was of modern construction; cement floors with tile walls, screened windows and doors, sufficient natural, as well as artificial light. The equipment, milk pails, cans and dump vat were of proper construction, adequate and approved. The dairy herd had the appearance of being thrifty, clean and was free from any clinical evidence of disease. The owner allowed a tuberculin test to be made.

This dairy had all the necessary requirements with the exception of an acceptable pasteurizer. It had an old "flash method" pasteurizer, but having been long unused, it simply would not work and we found pasteurization to be incomplete. Under the circumstances, we could not use the milk.

Eggs.—I referred to them earlier on a Class 4 inspection. Our specifications had to call for a basis of one pound per dozen. There is no such thing as "22-ounce" eggs in India to say nothing of those running 26 to 28 ounces per dozen. Although India is the original home of gallinaceous birds, the Western Nations have out-stripped that country greatly in developing improved breeds.

Eggs were received in various types of boxes, baskets, and other containers. All eggs were candled. We took what we found to be sound and wholesome and rejected the remainder. Some days we passed very few, as few as 25 dozen. Our normal daily requirements were, as has been stated, 1500 dozen.

This inspection was made at the Army Cold Storage plant, by two qualified enlisted men of the veterinary section and four civilians in the employ of the Subsistence Section. The civilians, of course, worked under the supervision of the veterinary enlisted personnel.

Accepted eggs were placed in strong reinforced boxes of my own design 25 dozen per box. Each candler was assigned a number.

Upon acceptance of 25 dozen eggs, the noncommissioned officer in charge stamped this number and the VC inspection mark on a slip of paper and placed it inside the container. This gave us an absolute check in case complaints were received from any of the messes. Containers as emptied, were returned, cleaned and re-used.

Over a period of three to four months, a total of 262,548 dozens were inspected. Of these 97,542 dozen were rejected as being insanitary, unsound, black rots, white rots, mixed rots, addled eggs, stuck yolks, moldy eggs, eggs showing blood rings and spots, eggs containing embryo chicks and eggs in other putrid conditions.

The author (wearing helmet) inspecting cattle offered for sale to the Army. This whole lot was rejected much to the wonderment and disgust of the contractor

Fish.—The source of supply of fish was very good and afforded us little or no trouble. The contractor had been in the business many years, had good clean fishing boats, which were well equipped and each had ice tanks installed for the purpose of handing the catch at sea as it was made.

Upon arrival of fishing boats from the sea, the catch was removed to the contractors packing establishment, an approved place, and there all products were inspected and dressed in compliance with the Army requirements, which called for the removal of head, viscera, gills, blood clots in body cavity, and thorough washing, with the skin on and unsplit. All fish were required to be strictly fresh, showing no evidence of staleness, unnecessary mutilation or unsoundness prior to freezing.

The selected product was then placed in artificial ice cans and frozen, removed from the cans and placed in clean gunny bags and held in the freezer until time of issue. This method and means of inspection and packing operated very well and usually assured a commodity in good condition upon arrival at the unit messes.

The varieties and sizes of fish available were: Surmai, five to 15 pounds; sua, five to 15 pounds; Salmon, three to 10 pounds; and shark, four to eight pounds.

Periodic inspection of native fishing boats was made at sea and it was a pleasure to find them always in the best of condition. This fish contractor was one native contractor who lived up to the letter of our requirements. Other potential bidders and contractors were disapproved in short order, when they were found to have little or nothing to offer.

Among soldiers, ice cream is the most generally liked food or confection. We lacked an adequate supply of the proper ingredients for ice cream but we were able to make a product that was highly appreciated from the following formula:

Sugar	11 pounds
Cornstarch	1 pound
Eggs	24 eggs
Butter	2 pounds
Condensed milk (unsweetened)	40 pounds
Vanilla extract	1 ounce

During the period January 1 to August 31, 1943, this inspection service conducted by the Veterinary Corp at Base Section No. 1 USAF, CBI saved the Government a large amount of treasure in addition to its principal function of conserving the health of the troops.

The average prices of the beef and poultry during the period covered were: Beef—Rs. 0/4/3 per pound, and poultry Rs. 0/14/5 per pound. The average weight of the beeves were 270.45 pounds per carcass, and the average weight of the poultry was 2.01 pounds per bird. From these figures and taking account of the amount rejected as unfit it shows a saving to the Government Rs. 147,412/-/9 ($44,670.31) for beef and Rs. 50,264/7/5 ($15,231.62) for Poultry or a total of Rs. 197,676/8/2 ($60,001.93) saved.

The average price of fresh eggs per dozen for the period was Rs. 0/15/4, which shows a saving to the Government of Rs. 121,927/8/- ($36,947.57) on this item, this figure being the price of that part of this product which would have been a total loss to the Government, had it been accepted.

Thus the saving to the Government, on these three subsistence items alone, was $96,949.50 or $12,118.60 per month.

This computation takes no account of the fact that but for this Veterinary Corps inspection service these local food products would not have been used at all. In their stead canned and dehydrated products from the United States would have been used at enormously greater cost in money and effort. Further the troops would have been deprived of these highly desirable fresh meats and eggs.

The Use of DDT in Medicine—a Review*

Clifford Westerfield**
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THE new insecticide, DDT, known to the chemist as dichlorodiphenyltrichloroethane, and sold under various trade names such as Gesarol, Neocid, GNB, etc., has been the recipient of wide publicity. Something less than 1000 articles were published up to July 1, 1945, dealing with this chemical. A complete bibliography of the work done on DDT up to that time has been prepared by Roark.[1,2,3] This insecticidal atomic bomb, the widely touted "insecticide to end all insecticides," has been declared one of the greatest discoveries of the present century. From the public interest aroused in this new chemical, we are led to believe that insect life is about to be exterminated at the hand of man, which, we are told, recalls the early days of bacteriology "when every one set out to sterilize the world."

According to entomologists of the U. S. Department of Agriculture,[4] experiments conducted during the past two or three years with DDT have proved it to be a promising chemical against many agricultural pests but it is not a cure-all or panacea for all the ills brought about by insects. More than 170 different species of insects and closely related organisms were used in these experiments. Among this large number were 30 species of insect enemies of field crops, man, livestock, and trees which could be controlled more readily with DDT than with other insecticides so far known. While DDT is an effective insecticide in many instances, it is also known that beneficial as well as harmful insects may be destroyed, and harm may come to plants, soil, livestock and wildlife through its promiscuous use. Toxic reactions also may occur in persons from the consumption of fruits and vegetables coated with DDT residues.

Now that DDT is available for civilian and agricultural purposes, veterinarians should acquaint themselves not only with the correct form of the material to be used for various conditions and proper methods of administration of this drug but with the toxic and pathologic manifestations in animals subjected to the indiscriminate use of DDT, which is sure to come with its availability and the great expectations from its use. "The more effective a therapeutic agent is, the more should its use be restricted to scientific directions."[5]

DDT is a practically odorless and tasteless, white, organic, crystalline chemical sometimes tinged with yellow, formed by the reaction of chloral hydrate, which is made from grain alcohol and chlorine, with monochlorobenzene in the presence of sulfuric acid and a catalyst. It is remarkably stable in nature, melting at about 108° C. The technical grade is agglomerated by humidity, but its action is not altered thereby. It is insoluble in water but is readily soluble in many organic solvents such as toluene, chloroform, acetone and ethyl alcohol, and only partially soluble in vegetable and mineral oils. The best solvents for DDT are said to be "cyclohexanone, xylene, soybean oil, cottonseed oil, fuel oil and kerosene—in that declining order, with solvency of 100% in the first named and 8% in the last."[6]

Like sulfanilamide, which was discovered many years before it became widely known, DDT was first synthesized in 1874[7] by a German graduate student but it remained unnoticed until 1939 when its value as an insecticide was recognized by the Swiss dyestuff firm of Geigy, U. S. patents being granted this firm in 1941. Because of the wartime shortage of rotenone, which is obtained from the East Indies, and of pyrethrum from Africa, and because of the critical need for vector protection on global war fronts, research on DDT was intensified and volume production methods instituted.

The results already form an important chapter of medical history, which begins with a louse-borne outbreak of typhus in Naples, Italy, being stopped in its tracks—an unprecedented accomplishment—and leading to the freeing of entire Pacific Islands and vast swamps from mosquitoes, flies and other dangerous insect pests by DDT sprayed from airplanes.

Mode of Action

Unlike most insecticides, DDT kills on contact, if eaten and by indirect contact.[7] In no instance does it produce instantaneous death; the insects being killed by a slow paralysis. It is not a repellent, and insects are killed after their feet come in contact with DDT-coated surfaces. Soon after coming in contact with DDT, flies exhibit frenzied activity followed by tremors, convulsions and paralysis of the legs and death within a few hours. Susceptible biting insects are killed by paralysis of the

*The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the director.

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mandible and the anterior portion of the digestive tract.

Davis,[8] of the U. S. Public Health Service, placed 10 fleas in a container with a small quantity of pure DDT. "Within half an hour the fleas could no longer jump. Some continued to move their legs but all died" within four hours. When 50 fleas were then placed in a jar containing one gram of DDT and 100 grams of floor scrapings, the fleas were paralyzed in five hours and dead by the next morning. The action of DDT is characterized by its slow "knockdown" and kill.

Limitations

Although extensive experimentation has been carried out by the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture during the past 2½ years, the knowledge of the use of DDT on farm crops and livestock is far from complete. In spite of all its good qualities, there are definite limitations to its use. Among those so far known are:

1. Only manufacturers should prepare insecticidal dusts and concentrates incorporating DDT. It should not be attempted without adequate equipment of the proper kind. Some of the details of this process are listed by Chisholm.[9] The formulae vary widely for different purposes.

2. Many beneficial insects, such as honey bees and insect predators, which hold in check harmful insects, are highly susceptible to DDT and are killed when within an area of its application. The pollination of certain food or seed-crop plants may thus be prevented.

3. DDT is ineffective against certain insects, and against other important pests it acts more slowly than rotenone or pyrethrum. Thus, the results have been disappointing in the control of screwworm flies, heel flies, ox warbles, tabanids or horse flies, sheep nasal flies, botflies of horses, chicken mites, chiggers, spiders and cockroaches.

4. It has been found to be definitely poisonous to warm-blooded animals and should not be used in such manner as to leave a residue on grain or forage that is to be fed to animals, or on fruit or vegetables that are to be used for human consumption.

5. In oily solutions DDT is readily absorbed through the skin and therefore dangerous to animals. Individuals using such solutions should be protected from them and in the spraying of buildings the possibilities of fire must not be overlooked.

6. DDT is destructive to cucumbers, melons and related plants, and when as much as 25 pounds per acre are applied to the soil it interferes with the growth of many flowers, vegetables, and other plants. The rate at which it is decomposed in the soil is not known. There is a possibility that in time an injurious amount might be built up in garden soil from frequent sprayings or dustings.

7. DDT is more poisonous to cold blooded animals than to mammals,[10] hence in wholesale spraying of swamps and ponds one may expect to kill a great many fish, frogs and other cold-blooded fauna as well as insects.

Toxicity

The toxicity of DDT is somewhat less than that of lead and fluorine. Massive doses of DDT whether inhaled, absorbed through the skin, or taken in by the mouth will cause toxic reactions in animals. Dogs have been poisoned when sprayed with oil suspensions since they are more readily absorbed through the skin, as already pointed out. It has been found that solutions of DDT in fatty oils are more toxic than when cyclohexanone is used as a solvent.

The symptoms of poisoning in warm-blooded animals are anorexia, severe weight loss, hyperexcitability, and nervous tremors leading to clonic convulsions. In dogs and cats neurologic symptoms are likely to be produced by a hypocalcemia rather than to direct action upon the nervous system or the nerve endings in the skin. Following spraying, dogs and cats have displayed symptoms of nervousness and excitement not unlike those of encephalitis. The symptoms, which are thought to be the result of the precipitation of calcium in the blood, are more pronounced in cats than in dogs. It is reported that calcium gluconate will relieve these toxic symptoms in three or four hours when given intravenously or intraperitoneally. The oral administration of calcium gluconate prior to spraying or dipping these animals with DDT will minimize if not prevent these toxic reactions. Urethane (ethyl carbamate) and dilantin (diphenylhydantoin sodium) are also listed as antidotes in recent U. S. Public Health Reports because of their sedative and anticonvulsant action. The Surgeon General's Office recommends tribromethanol, paraldehyde and barbiturates—the last named however are said by Harris[11] to be generally ineffective.

Studies conducted at the Industrial Hygiene Research Laboratory of the National Institute of Health in Bethesda, Maryland,[12] revealed that DDT in concentrations up to 10% in inert powders for dusting clothing, as in lice extermination, offered "no serious health consequences" in man, as has been demonstrated by the mass application of 5 to 10% DDT in talc powder on louse-infested persons so common under the crowded war conditions and

the absence of any possible means of keeping clean.

Experiments with animals have revealed a marked difference in susceptibility of different species as well as wide variation in individual susceptibility to this drug.[13] Mice were found to be more susceptible than rats. Of all the domestic mammals, although claimed by some to be undomesticated, cats are most susceptible. It has been found that toxic doses by the mouth range from 0.3 to 0.4gm per kilo of body weight. In a dog given 0.1gm per kilo daily in the meat ration for 13 days following an initial dose of 0.3gm per kilo the only symptoms of poisoning seen were emesis about three hours following the initial dose and at irregular intervals during the subsequent course of administration.[14]

The poisonous dose for cattle, as estimated by Johnson,[15] of the U. S. Bureau of Entomology Field Staff, is 20 grams per 100 pounds of body weight (0.44gm per kilo) which means that in power spraying with 0.2% suspension, "one cow would have to lick off all the DDT from 50 others to obtain a poisonous quantity." In the control of nucha flies and ticks, Squibb,[16] in Costa Rica sprayed cattle with a 4% solution of DDT in kerosene and never mentioned any untoward results on the animals treated. However, caution should be observed in the application of DDT in oil bases to animals, especially if applied at frequent intervals. Another fact to be borne in mind in connection with the toxicity of DDT is its cumulative poisonous effects when applied to the skin of animals over a considerable period.[17]

In an experiment conducted by research workers, in the U. S. Bureau of Entomology,[18] to determine the toxicity of DDT to swine, one ounce of 10% DDT in pyrox was added per bushel of corn. In a 30-day period the hogs consumed 336 pounds of the treated corn, or a total of 8.5 grams of DDT which was a daily average of 7.1 milligrams per kilo of body weight. During this period the animals remained normal in behavior and gained an average of 30½ pounds.

Orr and Mott[19] of the U. S. Department of Agriculture in testing the toxicity of DDT administered daily, oral doses of 0.1gm per kilo for one week, 0.15gm per kilo during the second week and 0.2gm per kilo for the third week to four cows, two horses and four sheep. The proper dose was administered by stomach tube to animals which failed to consume it with their feed. Loss of appetite was noted in all animals, and the horses lost considerable weight. The cows alone displayed other symptoms, including muscular tremors, lameness and hyperexcitability accompanied by a "wild stare" of the eyes. Animals examined post mortem exhibited hemorrhages on the heart and intestines.

In a detailed study of the toxic effects of this new insecticide, Nelson, *et al.*[20] of the U. S. Public Health Service administered DDT by inunction, by stomach tube and by admixture with the diet to 117 animals of nine different species as follows: rats, guinea pigs, rabbits, mice, chickens, dogs, cows, sheep and a horse.

The most noted symptoms produced were muscular tremors and lessened food intake. Death resulted in the small animals in from one to several weeks from a high level of administration. There were no outstanding gross pathological lesions in any of the species studied. The inuncted animals exhibited scaling of the skin with roughening and brownish discoloration. These changes, although never more than moderate in degree and usually no more than slight, were best seen in rabbits. Damage to the liver could sometimes be suspected grossly from the pallor or, less often, darkening of the centrolobular areas. In rabbits, the surfaces of the kidneys were slightly pitted.

It was found that about four times as much DDT is required to produce a given effect by inunction as by oral administration. For a given dosage level of DDT, chickens and guinea pigs displayed fewer microscopic lesions than did the other species studied.

The most characteristic and most frequent histologic lesion produced by DDT in higher dose levels, whether the animal lived for several days or several months, was a moderate degree of damage to the liver, usually in the form of a centrolobular necrosis or a combination of central necrosis and reparative hypertrophy—labeled a subacute degeneration of the liver.

Damage to the skin was essentially a hyperkeratosis and thickening of the stratum germinativum (spinosum) with no or very little cellular infiltration in the subjacent corium. In addition to these changes there was a slight focal necrosis of the epidermis in the skin of rabbits receiving higher dose levels.

The thyroid gland was often moderately depleted of colloid, less often there was desquamation of the follicular epithelium, and rarely epithelial hyperplasia.

Focal necrosis of skeletal muscle was observed in animals receiving larger doses of the drug. In view of the severe muscular tremors following the large doses of DDT, over 40 spinal cords, with 20 controls, and over 60 brains were studied and nowhere could any distinctive difference be found between test and control animals. Less attention was given

to peripheral nerves, but no lesions were recorded in the ones studied.

Rare myocardial and adrenal lesions were observed, while renal lesions were usually slight and infrequent. Apparently no effects were seen on bone marrow, bone, testis, pancreas, and spleen.

Telford,[21] investigating the toxicity of DDT, found that milk from goats which received single large doses (1.5-2.75gm per kilo, body weight) of DDT orally, killed white rats. The milk became toxic in 29 to 31 hours after administration of the drug and remained poisonous approximately one week. Furthermore, butter and cream from the treated goats were more poisonous than whole milk; skim milk was only mildly toxic. Some of the goats showed no toxic symptoms, yet their milk was poisonous enough to kill rats. Sprays made from butter churned from the milk of DDT-treated goats were significantly toxic when applied to flies.

Uses

Farmers and livestock producers are looking to veterinarians for dependable information concerning DDT and its use in the control of insect life detrimental to livestock and poultry. A summary of such usage in the field follows:

During the summer of 1945, some 6,000 Kansas cattle were dipped or sprayed with a suspension of 0.1 to 0.2% DDT under the auspices of the National Livestock Loss Prevention Board and coöperative agencies.[22] The number of flies was reduced from several hundred or a thousand or more to but 5 to 10 flies per animal. Cattle on which raw places persisted due to the action of fierce horn flies were relieved, and such spots healed soon after application of DDT. One application rid the cattle of horn flies for a period of 10 to 12 days. A second dipping or spraying greatly lengthened this period of action, and not over three dippings were necessary to eliminate fly trouble for the entire grazing season. Bulls which were literally covered with lice were freed of this parasite with one application. Cattle on feed stopped stamping, bunching, and seeking relief from flies soon after treatment. In fact, some cattlemen complained that they could not find their cattle so easily following treatment with DDT. Instead of standing and protecting themselves from flies, they were out seeking better grazing. Stockmen report that sprayed cattle make better gains than those not sprayed, the hair is brighter looking and the animals more restful.

It was demonstrated that rain did not materially affect DDT on treated cattle. Sunlight, however, tended to destroy its action in a week or more. For this reason, special emphasis should be given to the treating of the underline in cattle to control both flies and lice.

During the summer of 1945 some 6000 Kansas cattle were sprayed with DDT under auspices of the National Loss Prevention board

Dr. R. L. Squibb[23] of the Interamerica Institute of Agricultural Sciences used a mixture of DDT and rotenone of which 100cc costing less than one cent when applied as a fine spray rid one cow of ticks and was superior to the arsenic dip for cattle ticks in tropical regions where dipping vats are costly and scarce and where distant transportation results in high mortality and where personnel sufficiently skilled to employ the dipping vat is difficult to obtain. Protection has continued for as long as 80 days and in 7,000 applications, over a period of nine months, there was no indication of poisonous tendency. According to the same investigator[16] in tropical regions, particularly, good animal management is essential along with treatment for effective control of ectoparasites. Open-sided sheds which may be kept clean and sprayed are recommended for shade and weather protection.

One thorough application of 5% DDT in a light oil base is reported to keep down the fly and mosquito populations in cow barns and stables from three to five months. Barns which sounded like bee hives have been made practically free of flies. Complete fly control involves spraying the buildings that house the animals as well as the animals themselves. Munro, *et al.*[24] at the North Dakota Experiment Station conclude that the outstanding advantages of DDT for use in livestock barns against flies are: "(1) its convenience of ap-

plication and (2) its lethal action on blood sucking species, such as the stable fly, which will not normally enter a fly trap."

U. S. Department of Agriculture investigators in Florida[25] found DDT in concentrations of 0.25 to 0.5% sprayed under 350 pounds pressure onto heaps of cow manure prevented both house flies and stable flies from emerging while large numbers of flies of both species emerged from untreated heaps.

Cobbet and Smith[26] of the Zoological Division of the Bureau of Animal Industry, U. S. Department of Agriculture, during July and August, 1944, dipped six lots of sheep infested with so-called sheep ticks, or keds *(Melophagus ovinus)* in unheated aqueous baths containing DDT in concentrations varying from 0.1 to 1.0%. They found DDT in aqueous suspensions of as little as 0.1% compared favorably with rotenone-bearing products for the control of sheep ticks, while dipping the sheep in aqueous suspensions of DDT containing as much as 1.0% of the insecticide resulted in no apparent injury to the animals.

Many dead ticks were found on the sheep following treatment, and it is apparent from their observations that young ticks continued to emerge from viable tick pupae remaining in the fleece for a post-dipping period of at least 14 days. All of these succumbed to the DDT which remained in the wool, resulting in the ultimate eradication of the tick infestation in all lots of sheep so treated.

They found that the DDT did not break down into particles sufficiently fine to produce a uniform suspension. If large flocks of sheep were being dipped, these workers suggest the possibility of most of the DDT being carried out of the dip by animals early in the dipping process. Also the DDT settled rapidly to the bottom when dipping was momentarily interrupted. Agitation of the dip by the swimming sheep, however, tended to overcome this difficulty. They tried the incorporation of methyl alcohol and of a commercial sulfonated soybean-oil emulsifier into the dip. Neither was satisfactory for the purpose, and the latter caused an undesirable matting of the wool of the dipped sheep.

Research workers at the University of Idaho[27,28] found that unshorn sheep can be successfully sprayed with one application of an aqueous suspension containing 0.25% DDT. Only the wettable form of DDT should be used, and the sprayer should develop at least 400 pounds pressure. From two to three quarts of the spray material per sheep were required. The cost of the material was about two cents per head and from 200 to 300 sheep per hour could be treated with a good spray machine. This method was also found effective against both sheep ticks and wood ticks. Long wool on sheep tended to hold the DDT and to protect it from the sun rays longer than short wool. They advise the control of sheep ticks in the fall to insure the sheep to be free from ticks all winter. If not all ticks are killed at that time, the ewes should be sprayed again before lambing time. To protect them from

The hand "gun" has many uses besides spraying around a farm or ranch

wood ticks, flocks should be sprayed just before being moved to spring range. Protection from one treatment lasts about a month. Full fleeced sheep are sprayed on a strip along the neck and back. Shorn sheep should be sprayed on the undersurface as well. The investigators had a long chute of low panels made, and the spray was applied under 400 pounds pressure to the necks and backs. They stated that the "car washer type" of spray gun was the most practical.

Bruce and Smith[29] found that a soluble-pine-oil emulsion containing 0.2% DDT killed hog lice *(Haematopinus adventicius)* during motile stages and was effective for one week. Two treatments eliminated all lice.

Tests with DDT against fleas on dogs were carried out by Lindquist, *et al.*[30] with the following results: from dogs dusted with 4 to 5% DDT in an inert powder base, using about 10 grams for animals of medium size, fleas began to drop off in 10 to 15 minutes and died in from three to five hours, others died on the host. Dogs treated with DDT were completely freed of fleas and were protected against reinfestation for four to seven days, while untreated dogs continued to harbor the pests, and rotenone-treated ones were protected for only two days. No toxic symptoms were noted.

The brown dog tick can be controlled easily by the use of DDT. It is suggested that about ¼ teaspoonful of 10% dusting powder be dusted on a dog of average size. Cracks and crevices about baseboards and tick-infested floor coverings should be treated with the same material, leaving it for about two weeks due

to the dust's slow killing of ticks. It can be removed with a vacuum cleaner and a second treatment applied if necessary.

Warren[31] found that DDT in concentrations up to 10% was not superior to sodium fluoride in the control of chicken lice, and did not protect chickens after the usual life cycle of two to three weeks. A 3% concentration was inferior to sodium fluoride.

According to Tate,[32] head of the Department of Entomology of the University of Nebraska, a chicken house which had been heavily infested for a number of years was entirely freed of bed bugs by one application of a 5% aqueous emulsion of DDT. He reported that after more than six weeks there was no evidence of reinfestation. Parish[33] reported successfully treating poultry houses infested with fowl tick *(Argas miniatus)* by the use of 5% DDT in kerosene. The spray was applied to the perches, cracks, crevices and other hiding places. Three months later no ticks were found.

Research workers at the Delaware Experiment Station[34] found a water emulsion of DDT as efficient as phenothiazine when used as a larvacide on the manure under wire turkey sunporches, and superior to water solutions of borax and thiourea. The larvae in DDT-treated manure rose to the surface and perished in large numbers. It also reduced by 90% the number of flies emerging from the manure.

If after trying DDT, the wonder drug doesn't come up to your expectations, don't be too much discouraged, for British chemists have discovered a new super-DDT, known as gammexine or "666," which is just twice as toxic to insects as DDT. It is not known as yet, however, whether its effects are so long lasting.

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Toxicity of Sodium Chloride Solution for Baby Chicks*

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TOXIC action of sodium chloride solution for young fowls has been reported by Seyle[1] in chicks and by Scrivner[2] in poults. The symptoms and lesions reported by these investigators correspond closely to a naturally occurring disease observed by us in a flock of two-week-old chicks. As reported by the flock owner the first symptoms of ill health, gasping and labored breathing, were noticed when the chicks were two days of age. On the third and fourth days a large number of chicks were showing generalized edema and increased respiratory distress. Post-mortem examination of chicks two weeks old revealed severe edema of all subcutaneous tissues and fascia with an accumulation of fluid in the body cavities. Except for a few cases in which streptococci and *E. coli* were recovered from the livers and yolk sacs, bacteriological examination gave negative results. Inquiry about source of feed and water brought information that the chicks were receiving water from a saline or "soda water" well which resulted from test drilling for oil. Samples of water from the well titrated with silver nitrate revealed a chlorine content of 0.54% expressed as NaCl. Analysis of the water for sodium revealed a content of 0.7+% expressed as sodium chloride.

TABLE I.—MORTALITY RATE OF CHICKS RECEIVING WATER FROM SALT-WATER WELL

Age of chicks weeks	Deaths each week	Total mortality
1	147	147
2	306	453
3	78	531
4	14	545
5	24	569
6	54	623
7	106	729
8	331	1060
9	107	1167

The weekly mortality in the flock of 3150 chicks is shown in Table I. It will be noted that the mortality was greatly reduced during the fourth and fifth weeks. In the latter part of the fifth week an outbreak of coccidiosis occurred, and this was followed by a period of hot, dry weather during the seventh and eighth weeks. The symptoms due to salt toxicity subsided during the third and fourth weeks and reappeared in the seventh and eighth weeks. Apparently the high mortality during this period was due to the toxicity of the water together with the hot weather and the coccidiosis.

Experimental Studies

The investigation consisted of three experiments in which solutions of c.p. sodium chloride in tap water were used as the only source of water. Day old chicks were used. Estimations of feed and water consumption were made daily and the chicks were weighed at weekly intervals. In the first experiment, groups of chicks received 0.25%, 0.50%, 0.90% and 2.0% NaCl in the water and feed without common salt. The second trial was a repetition of experiment I, except for omission of the group receiving 2.0% NaCl. In the third experiment the chicks were given feed containing 1.0% common salt and water containing 0.25, 0.50, 0.90 and 1.50% NaCl. Control groups receiving tap water were kept for each trial. The first experiment ended when the remaining chicks were four weeks old and the second and third when they were three weeks of age.

Results

In the groups receiving 1.5% and 2.0% NaCl solution some chicks were showing symptoms of toxicity at the end of the first 24 hours, and nearly all were affected on the second day. The chicks had consumed a large amount of the salt solution and very little feed. The feces were very watery. Only a few chicks were active; most were sleepy. These could be aroused, but were sleeping again in a few minutes. Those chicks which were not somnolent showed symptoms of nervous disturbance, including opisthotonos, convulsions, incoordination, and inability to stand. The somnolent chicks frequently had convulsive attacks when aroused. All chicks in these two groups (1.5% and 2.0% NaCl) were dead on the fourth day.

*The investigation reported in this paper is in connection with a project of the Kentucky Agricultural Experiment Station and is published by permission of the Director.

The three groups of chicks receiving 0.9% salt solution showed none of the nervous symptoms previously described. The first symptoms noticed were extreme thirst and a watery condition of the feces which appeared on the second day. Evidence of toxicity, characterized by generalized edema and short, rapid breathing appeared on the third day. The chicks were severely edematous on the sixth day, some being more than twice the normal weight for their age. All chicks which died were severely edematous, although in a few the edema partially subsided before death occurred. The edematous condition gradually disappeared during the second and third weeks in the chicks which survived. Palpable edema was not present at the end of the third week. No significant difference in severity of symptoms was observed between chicks receiving feed without salt and those with 1% salt in the feed.

In the chicks receiving water containing 0.5% NaCl, approximately 25% of each experimental group developed palpable edema during the first two weeks. Symptoms shown by affected chicks were similar to those previously described, but the condition developed more slowly. All evidence of edema had disappeared at the end of the third week.

The three experimental groups receiving 0.25% NaCl showed no symptoms referable to action of the salt.

In the groups receiving 1.5% and 2.0% salt solutions, the chicks dying during the first two days showed a slight edema of the tissues. Those dying later were dehydrated. A few showed a slight amount of hemorrhage into the intestines, but usually the intestines were slightly pale and edematous. The livers in these two groups were usually yellowish or a mottled yellow color. In nearly all chicks the kidneys were slightly enlarged and grayish. The heart was dilated and the spleen a pale color.

The gross pathological changes in affected chicks receiving 0.9% and 0.5% NaCl were similar in all groups. The connective tissue areas in all parts of the body contained thin, watery fluid which drained away rapidly when the skin was removed. Fluid was found in the peritoneal cavity, pericardial sac, and thoracic cavity. In some cases the air sacs were filled with fluid. The heart was pale and usually dilated with thinning of the ventricular walls. In general, the liver appeared slightly enlarged and pale. The kidneys were usually enlarged and grayish with a red mottling. The size of the spleen was not affected. No changes other than edema were found in the digestive and respiratory systems.

In the 0.9% salt groups, the chicks which were killed at three and four weeks of age showed dilatation of the heart, and some had strings of fibrin in the peritoneal cavity. The kidneys of a few appeared smaller than normal. Chicks from the 0.5% salt group showed no gross lesions when killed at three and four weeks of age. Chicks from the 0.25% NaCl group were free from lesions referable to salt action when examined at three and four weeks of age.

Water consumption by the different groups of chicks varied with the NaCl concentration. The amount of fluid taken was smaller as the

TABLE II. MORTALITY IN CHICKS RECEIVING SODIUM CHLORIDE SOLUTIONS AND FEED WITHOUT SALT

Group	No. of chicks exp. I	exp. II	Mortality by days 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Control	18	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.25% NaCl	18	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.50% NaCl	20	15	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
0.90% NaCl	19	17	0	0	1	5	5	5	6	2	2	1	0	0	0	0	27
2.0% NaCl	20	0	4	4	6	6	0	0	0	0	0	0	0	0	0	0	20

TABLE III.—MORTALITY IN CHICKS RECEIVING SODIUM CHLORIDE SOLUTIONS AND FEED CONTAINING 1.0% SALT

Groups	No. of chicks Exp. III	Mortality by days 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Controls	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.25% NaCl	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.50% NaCl	20	0	0	1	0	0	0	1	0	0	0	0	0	0	1	3
0.90% NaCl	20	0	0	0	1	1	2	1	2	1	4	2	2	1	0	17
1.50% NaCl	20	1	2	3	14	—	—	—	—	—	—	—	—	—	—	20

salt concentration decreased and was least in the control groups which received tap water. The chicks receiving 1.5% and 2.0% salt solutions took practically no feed, those receiving 0.9% salt consumed roughly ⅔ as much as the controls during the first two weeks. There was no evident reduction of feed consumption in the 0.25% salt groups. The growth rate was definitely reduced in the three groups receiving 0.9% NaCl in the drinking water. The growth rate of the chicks receiving 0.5% NaCl was reduced slightly and they were somewhat unthrifty in appearance. No difference was noted between the 0.25% groups and the controls.

Histological study was made on the heart, liver and kidneys of chicks from all the experimental groups. In chicks from the 1.5% and 2.0% salt groups the heart muscle showed albuminous degeneration. Fatty infiltration and albuminous degeneration were found in the liver. The kidneys showed albuminous degeneration of the proximal and distal convoluted tubules.

Chicks dead from salt toxicity in the 0.9% group showed varying degrees of albuminous degeneration of the heart muscle. Albuminous, fatty, and hydropic degeneration were found in the hepatic cells. Desquamation and necrosis of the bile duct epithelium was observed in a few livers. In the kidneys, there was extensive albuminous degeneration of the proximal and distal convoluted tubules and in a few instances nuclear lysis and pycnosis were observed. The collecting tubules showed severe hydropic degeneration. Albuminous degeneration of Bowman's capsule and the glomerular epithelium was observed regularly. Cellular and granular casts were present in some cases and interstitial edema was present in all sections examined.

Microscopic changes in the organs of chicks dead from salt toxicity in the 0.5% groups were essentially the same as in the 0.9% groups.

Histological examination of chicks from the 0.5% group which were killed at three and four weeks of age revealed no change in the heart or liver. Albuminous degeneration was found in Bowman's capsule, the glomerular epithelium and the proximal and distal convoluted tubules. Nuclear pycnosis was present in some proximal convoluted tubules. The collecting tubules showed hydropic degeneration in some sections and there was proliferation of the interstitial tissue in nearly all sections. Surviving chicks from the 0.9% groups which were killed at three and four weeks of age showed the same changes as observed in the 0.5% group. These changes, however, were more extensive and more pronounced in the 0.9% groups. No lesions were observed in chicks of the same age receiving 0.25% NaCl.

Summary

Water from a saline or "soda-water" well containing chlorine equivalent to 0.54% sodium chloride and sodium equivalent to 0.7+% of sodium chloride was found to be toxic for young chicks.

Experimental use of solution of c.p. NaCl in concentration of 0.5% and 0.9% as drinking water produced disease in day-old chicks, identical with that resulting from use of the well water.

Clinical evidence of toxicity was not observed in chicks receiving 0.25% NaCl during three- and four-week trials.

Concentrations of 1.5% and 2.0% NaCl in the water caused acute toxicity with nervous disturbances, including somnolence, convulsions, incoordination, and inability to stand.

References

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Veterinary Practice—IV

Equipment

By E. T. BAKER
Moscow, Idaho

LAST week, the value of having good equipment was impressed on me when a very good client asked me to destroy an old team, 32 years old. He said they were almost blind and had lost all their teeth. He added he wanted to give them a decent funeral for they had been a faithful team. He also stated he wouldn't have any neighbor do the work because he didn't want a "botched up" job.

Imagine my surprise when I drove out to the ranch and found two old horses I had doctored since my first year in practice. In 1913, I had treated Queen for navel-ill when she was only a few days old. I had castrated Prince when he was a yearling.

Through three decades I had brought them out of equine influenza, impaction, colics, wire cuts and numerous other ailments, and had floated their teeth a number of times. It was a tough assignment, and I was thankful I had brought my old hunting rifle, a 25.35 Winchester.

We walked up a meadow where the two old horses were grazing, and the owner lead them to an isolated place he had picked out. He had dug two large graves, and he asked me to shoot the mare first, as old Prince was his favorite.

Taking careful aim, the powerful bullet pierced her brain, and she dropped without a struggle. Prince was next and, as my eye glanced along the gun barrel, there was a slight mistiness. But Prince dropped too, never knowing what hit him. The owner took off their halters and, as we rolled them into their graves, neither one of us said a word.

When we walked back to the house and I entered my car, he asked:

"How much is it, Doc?"

"Nothing, I'm thankful there was no suffering."

A couple days later I opened a plain envelope with nothing in it but a ten-dollar bill.

Most people have the same feelings about animals and it should be our aim to handle them as carefully and humanely as we can. Now, I am not sentimental or soft hearted but I do think one of the best ways to build up practice and good will is to be able to do work that is "not botched up."

Perhaps this seems like a queer subject to mention in the same breath as equipment, but it pays, nevertheless. A man may kick his own hound dog, but he doesn't want anyone else to do it.

Changes in Equipment

Practice is changing so rapidly that no cut-and-dried statements can be made regarding equipment. As we all know, technic of treatment shows continual progress, and the udder inflation pump of yesterday is now drying out in a dark corner of the medicine room.

Then again, economic upheavals affect our practice, as witness the decrease in equine work and the rise of bovine, swine, sheep, small animal and poultry therapy.

Different sections of the country require specialized equipment, and what may be useful in New England may be unheard of in the Southwest.

For these reasons we are not laying down any "must have" suggestions, for each practitioner must work that out for himself. Therefore, we are merely going to mention what we have found useful in our practice to obtain results such that our clients call us back again.

Car Equipment

In 32 years we have had six Buick coupés. We happened to purchase our first one because that car had a good agency in our town, and we have had our car serviced at the same place during all these years.

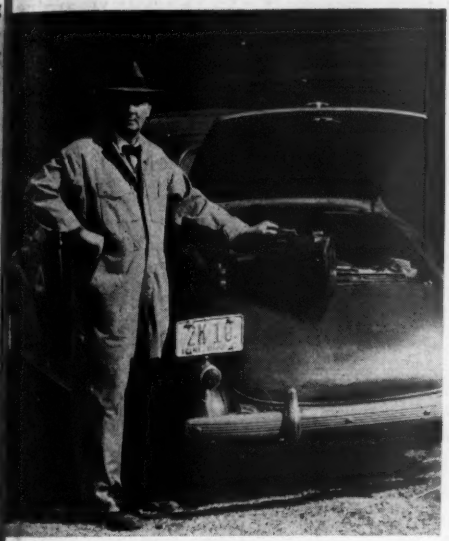
Now, there are many good cars on the market, but we emphasize the importance of having a reliable garage to depend on. We prefer the coupé for practice because the rear deck will hold our supplies. We like to run a set of good, six-ply tires and new tubes about 12,000 to 15,000 miles and then turn them in for new ones. Fortunately, for us, we had just performed this little stunt before rationing crept up on us.

Driving on all kinds of country roads keeps us slowed down to around 30 to 45 miles per hour and we travel over some very rough trails, especially while doing sheep work.

With a good, reliable car in tiptop condition at all times, the practitioner is ready for business and, to be able to cope with any ordinary emergency, we carry the following equipment:

Emergency Grip.—A solid cowhide grip, of the best grade obtainable is a constant companion. Remember, in all veterinary equipment, the best is the cheapest in the long run. In this emergency grip we carry a 10cc solid, three-ring hypodermic syringe for oils; a curved balling gun with springs; metal and rubber catheters; a thermometer; a bloat outfit consisting of one large bovine trocar; two equine trocars; one cecal trocar, all wrapped

n a towel; two small curved knives (teat-litting type) for skin incisions; an intra-enous outfit; hypodermic tablet case; two ide-mouthed vials with common hypodermic olutions ready for use; liniment; colic mix-ure; diuretic elixir; sedatives; aromatic anti-eptic; sterile camphorated oil; lentin; hemo-



he author—ready for anything he may be called upon do. Emergency grip and all placed compactly and easily accessible

tatic serum; alcohol for hypodermic site; nor-al serum; biological products as needed; dose yringe and extra hypo-needles.

We also carry a wide-mouthed vial of elixir actated pepsin. When we give a capsule to a orse or cow, we dip the capsule in this, and nd it renders swallowing more easy, espe-ially if more than one capsule is to be given.

We have a small hole in the cork of our lcohol vial, so that we can rub it over the site f injection.

All of these supplies are well wrapped in owels, and the bottles arranged in the side oops.

Once a year, we warm a little neatsfoot oil, nd have our grips slightly warmed, and then pply the oil to all the leather and loops. By oing this a grip will last from 20 to 30 years—f handled carefully.

Of course, the season causes the contents of he grip to vary somewhat, as different ail-ments occur in the spring, summer, fall or inter.

About every month we have a general clean p of each grip, and we always carry along xtra instruments commonly needed, such as hypo or dose syringes; intravenous outfits; needles, etc.

Surgical Grip.—This is an old emergency grip demoted to an instrument case of solid cowhide. It contains bistouries, curved scissors, etc. These articles are wrapped in a clean towel to prevent scarring. For years we have carried a Remington hunting knife to be used in autopsies. A hoof set; vulsellum and rat-tooth forceps; tape, sutures; needles; needle holder; bandages; cotton medicated oakum; tincture iodine; tincture ferric chloride; red oil; balsam; aromatic spirits of ammonia; methyl-violet solution; sweeney vials; escharotic paste; blister; absorbent; teat ointment, etc. Dusting powders and adhesive tape.

Obstetrical Grip.—A retired travelling bag containing rubber gloves; wax dilators; teat instruments; pituitary extract; uterine capsules and oil; sow forceps; antiseptics; extra small boxes of capsules, etc.

Obstetrical Fibre Case.—This case contains instruments used for "pullin' calves," and other reluctant fetuses that do not want to face a confused and changing world. In this case there is a good wire stretcher; four 30-inch chains with two handles; one 60-inch chain; four halter chains with double snaps on each end. These are handy when the expectant mother is lying in a creek or in a bunch of rose bushes. Strange to say, we have had a few obstetric cases that were not in sanitary box stalls. We carry a 15-cent penknife we swiped from our boy. It has a curved blade, and beats any complicated embryotomy knife we have ever used. We also carry some sash cord, cake of antiseptic soap; aromatic antiseptics and towels. We also take along a gallon of warm water, when we know we are going to a coming out party.

We also carry a foot and head obstetrical snare which we have found very practical. When the head or foot is turned back, one can slip this over, and then while one repels the little stranger, the owner can do about $15 worth of "pullin'" (or should we be scientific and say traction?). We also carry an old pitchfork handle which can be sterilized and used to repel a twin when there is not much room to work.

As has been said before, two of our favorite cases are milk fever and bovine obstetrics. We have a routine for these that brings success in most of the cases, but more of this later; we haven't finished with the car equipment yet.

Fibre Case.—This for an injection pump and tube.

Testing Grip.—This is mainly for tuberculin testing and brucellosis work, but equally convenient for the thybromol and Ross tests.

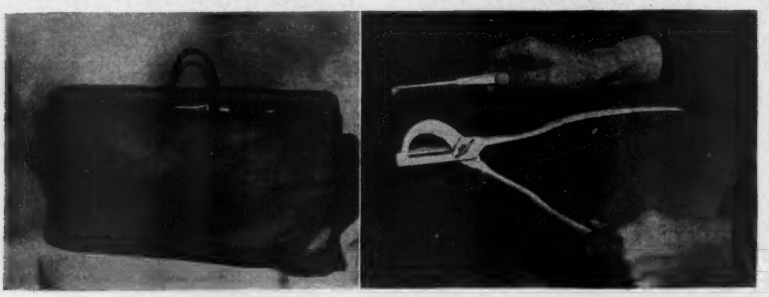
Ginger Ale Case.—The dozen compartments into which this box is divided make it convenient for bottles of bloat, colic, founder, indigestion and influenza medicine; also for glycerin and water for enemas; extra bottles of liniment and calcium gluconate, together with tonics, etc.

The time to give a client a bottle of medicine is when he wants it. Tomorrow or next week is too late.

Dental Roll.—This is not regular equipment but is carried as needed.

Castrating Outfit.—This too is taken only when needed.

In addition—we carry a 10-quart aluminum bucket; rope halter; lariats; obstetrical suit; noser and anti-kickers; and auto accessories, which include a shovel, axe, hatchet, tow chain, tire chains and extra tire in addition to the usual auto tools. Of course we also carry a camera and a revolver. Everything (except the cases) is wrapped in towels or gunny sacks to prevent breakage or other damage.



A large grip holds the castrating outfit. The hooked knife and emasculator are my preference

Special equipment, such as extra medicines, various hypodermic, dose and injection syringes, biologics and surgical supplies are kept in our medicine room, or in a warm room in the house during winter.

We try to keep about a year's supply of everything, so that when the war scarcity hit us, we were well prepared. There is no sadder feeling than to be caught short when a good call comes along which you are unable to handle for lack of supplies. It is much like not being able to change a twenty dollar bill when it is flashed on you, perhaps for the last time.

Books and Magazines

A well selected library has always been useful to me, especially for reference work. When I was a boy at home, it was a custom of the family to look up any common question of the day. It is much like being interested in some island of the Pacific or over in Europe, where one's boy happens to be. The old atlas or maps are carefully scanned.

What the practitioner wants is short, authentic information. For example, I read many long winded articles on sulfanilamide. Finally I ran across one that first gave the correct pronunciation, and then described its action in simple language. The same applies to DDT and penicillin. Too many writers like to show off their scientific knowledge, so that a common reader, like myself, gets lost in the fog. This reminds me of a county agent who came into a veterinarian's office when the product was brand new and asked the veterinarian where he could obtain some dichloro diphenyl trichloroethane. Asked if he meant DDT the C.A. replied "Oh yes! DDT, that's it. I never can remember that name."

Our magazines are extremely helpful in giving us the latest news about practice, and what others are doing. It is too bad, from the practitioner's standpoint, that they publish so many long-winded articles dealing with the impractical or ultra-scientific, but, of course, they must cater to all branches of our profession.

(To be continued)

Tragedy of Practice

Once, we were called to see a flock of sick sheep, owned by a young fellow who had just moved into the country. He was living in an old shack, and we felt so sorry for him we charged only five dollars for the call—less than mileage.

Imagine our red neck when he pulled out a large, fat wallet, and carelessly extracted a twenty dollar bill from its many comrades.

Later on, we learned his folks back east were worth half a million dollars, and he had come out here for his health. The next year he built a modest $25,000 country home, equipped with every modern electrical convenience.

That was some years ago, but we can truthfully say we have never made the same mistake since.—*E. T. B.*

Clinical Reports

Internal Parasites in Five-Week Old Great Dane Pups

This is a composite report on four Great Dane puppies, belonging to the same litter. They were five weeks of age.

July 16, 1945, two Great Dane pups were brought to the clinic for treatment. Their buccal mucous membranes were very anemic, the eyes were sunken, the animals were bloated, the hair coat was lusterless and the pups showed marked depression. The owner gave a history of digestive disturbances and diarrhea in which the feces were blood stained. Examination of the feces showed the eggs of *Toxocara canis, Toxocaris leonina,* and *Ancyclostoma caninum.* The treatment given the two pups varied somewhat.

Pup No. 1, which showed a temperature of 104.2° F., was given a transfusion of 20cc of canine whole blood from a vigorous adult and 2cc Hoar's mixture. The pup was apparently past medical aid as it died during the night.

Pup No. 2, which had a temperature of 103.5° F., was given 20cc of whole blood subcutaneously, 2cc of Hoar's mixture *per os* and a 1%, pine oil bath to get rid of the fleas *(Ctenocephalides canis).* The next day the pup's temperature was 101° F. and he was given an additional dose of 1cc of Hoar's mixture. As the fecal material he had discharged through the night was of a watery nature, he was given a warm water bath and dried with a warm air drier the while being rubbed briskly with a towel. He was fed a few small pieces of raw beef and given warm whole milk. The next morning the pup showed very distressing symptoms. His mucous membranes did not show any change, he had voided a great deal of putrid watery discharge both as fecal material and vomitus. His temperature had dropped to 96° F. He was immediately given a warm water enema in a desperate effort to restore body heat and additional heat was provided in his cage. These measures were of no avail as the pup died within two hours.

A post-mortem examination was made on both of the pups and the small intestines were revealed to be filled with *Ancyclostoma caninum.* The liver and lungs showed many areas of damage caused by the migration of the larval forms of *Toxocara canis* and the bile ducts were plugged. The lungs showed the typical pneumonia picture so common in heavy infestations of Toxocara.

July 22, 1945, another pup from the same litter was brought in showing the same symptoms as the two pups previously discussed, but milder. This pup had a temperature of 100.8° F., pulse 90, and respiration 25 per minute. He was given a 1% pine oil bath to get rid of external parasites. Laboratory examination showed the presence of *Ancyclostoma caninum, Toxascaris leonina* and *Toxocara canis.* He was given 1cc of a commercial mixture which consists of N-Butyl chloride 98.5%, inert ingredients 1.5% after which he was fed raw beef muscle and warm whole milk.

The next day the pup was bathed to remove the dung which had accumulated on his body. He was given small bits of beef muscle, raw milk, and two vitamin B and iron tablets.

July 24, the dog was given a warm bath, 1cc of the mixture described above, one vitamin B and iron tablet and fed fresh raw beef. His mucous membranes were beginning to show some color indicating that the dog's resistance was improving and the parasites were losing their hold.

July 25, the same general treatment was given as set forth above with the exception of the anthelmintic. The pup was showing great improvement and was allowed to exercise for a short time.

The next day he was given 1cc of the commercial anthelmintic, two vitamin B and iron tablets and the usual raw beef and whole milk. His mucous membranes by this time were assuming a natural color and the animal was showing typical puppy behavior.

The dog was sent home on the 27th with instructions to bring him back on August 1st. When he was returned a general check-up was made and his temperature was 101.3°F. the mucous membranes were pronunced normal and he was behaving in typical puppy fashion. Laboratory examination of the fecal material was still positive for large intestinal round worms so he was given 1cc of Hoar's mixture. His ears were cleaned out with a mixture of equal parts of olive oil and tetrachlorethylene. He was given 5cc of homologous anticanine distemper serum and sent home.

In the meantime the fourth pup of the litter had been brought in for treatment in about the same condition as the third puppy. He received essentially the same treatment with equally gratifying results.

Circumstantial evidence points to the possibility that the pups from this kennel are infected with hookworms and roundworms even before birth. This possibility has definitely been proved to exist by the able research of A. O. Foster, entitled "Prenatal infection with

dog hookworm, *Ancylostoma caninum*." *J. Parasit.* 19:112-118. 1932, Fulleborn, 1921, and Shillinger and Cram, "Parasitic infestation of dogs before birth." *J. A.V.M.A.* 63:200-203. 1923.

Louisberg, Kans.

MARVIN JOHNSON

Vicious Union of a Fractured Tibia in a Deer

In March, 1946, there was brought to this laboratory, by the Colorado Game and Fish Department, the right hind limb of a deer which had been removed at the stifle joint.

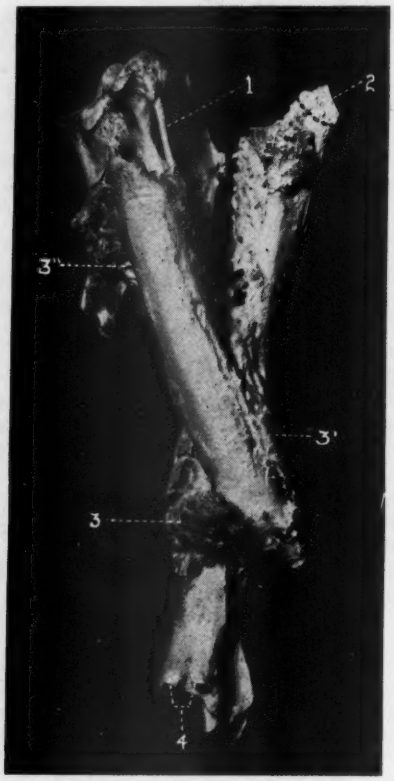


Fig. I. Antero-lateral view of right tibia and fibula of a deer. (1) Fibula (broken in process of cleaning); (2) exposed portion of tibia (shown by dotted line); (3) 3' 3" spongy bone; (4) lateral malleolus

The carcass of the deer had been confiscated when found in the possession of a poacher, who had killed the animal out of season. The leg could very well have been broken by a hunter's bullet during the hunting season about four months previously, the amount of comminution and extent of the repair processes indicating this possibility.

When received at the laboratory the leg was in a fresh state with skin and flesh intact. Contraction of the surrounding muscles during life had shortened the fractured tibia to about one-half of its normal length. The hoof showed no sign of recent wear, indicating that the animal had not yet begun to bear weight on the limb. Whether the animal would have ever put full weight on it is a moot question.

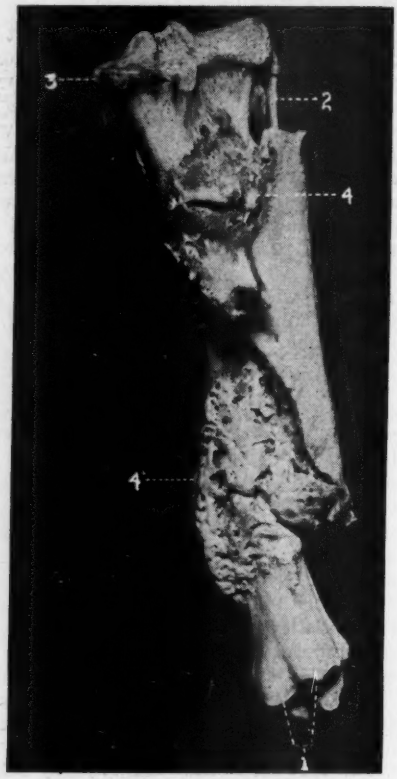


Fig. II. Posterior view of right tibia and fibula of deer. (1) Lateral malleolus; (2) fibula; (3) medial condyle; (4) and 4' spongy bone

The portion of the bone indicated in the photograph (Fig. I, 2) was projecting through muscle and skin; about 2cm of it being exposed. The remarkable feature was that there were no signs of infection which are usually found in compound fractures in our domesticated animals. Evidently the pyogenic organisms are not very prevalent in the wilds, or this deer had remarkable powers of resistance against such bacteria. This animal probably licked the wound continuously, which may help to explain the absence of infection.

After maceration and cleaning, the extent of the fracture and of the repair processes could be clearly seen. There was a great deal of soft spongy bone (Fig. I, 3, 3', 3"; Fig. II, 4 and 4') about the edges and ends of the

pieces of the fractured tibia. This spongy bone was impregnated with cartilage in the fresh state.

Unfortunately the fibula (Fig. I, 1; Fig. II, 2) was broken during the process of cleaning, but it had an approximate length of 15cm. It lay along a piece of the tibia and was not attached abnormally to that bone.

The distal extremity of the tibia had rotated so as to throw the limb below it outward. Careful examination of the photographs will illustrate this feature.

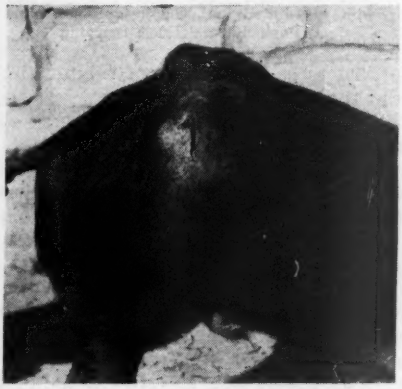
Although this article would seem to offer nothing of practical value, it does serve to illustrate the measures taken by nature, unaided by man, in attempting to repair an extensive injury.

LUKE R. SINCLAIR

Ft. Collins, Colo.

Lipoma in a Pig

A Duroc Jersey, boar pig weighing about 75 pounds, was brought in Aug. 17, 1945. There was a firm swelling in the lumbar region and right paralumbar space, extending down toward the right flank, that had been developing for several weeks. There was an open wound, due to traumatism, and some granulation tissue at the dorsal margin of the swelling. The swelling extended about an inch beyond the normal contour of the body. There were no other symptoms.



Large lipoma in a pig. The incision shown was made to obtain a specimen for biopsy

Neoplasms of a melanotic type are quite common in the Duroc Jersey breed and a provisional diagnosis of melanoma was made. A piece of tissue about one-half inch square and three-fourths inch deep (see illustration) was taken from the region. Upon sectioning this piece of tissue it was found to be a lipoma.

Lipomas are often times readily dissected out and removable. Because of the extent of this lipoma this radical operation was not advised.

The pig was sent home with advice to the farmer that early slaughter and salvage of the unaffected portion of the carcass was probably the most economical procedure.

JOHN WOODBRIDGE

Huntsville, Arkansas

Enterotomy in the Dog

November 7, 1945, a male, smooth-haired fox terrier was presented at the hospital for treatment. The dog was six years of age and weighed 20 pounds.

History.—The owner stated that the dog had eaten a rat several days previously and since had been vomiting and off feed.

Symptoms.—The only symptoms observed were anorexia, depression and weakness. The temperature was normal.

Treatment.—A gastrointestinal lavage was attempted, but was unsuccessful. One hundred fifty cubic centimeters of 5% dextrose in saline solution was given intravenously.

November 8, palpation revealed a small, hard mass within the abdominal cavity, evidence of a foreign body could be seen with the fluroscope. Lavage was again attempted but to no avail. A test meal of two ounces of bismuth subnitrate in water was given via stomach tube. Dextrose solution (150cc of 5%) was administered intraperitoneally to provide energy and to combat toxemia. Several hours later the fluoroscope revealed that the test meal had progressed only a short distance beyond the pylorus and then stopped.

In the morning of November 9, an X-ray photograph was taken to aid in the diagnosis. It revealed that only traces of the bismuth had passed the point of obstruction.

Diagnosis.—A diagnosis of intestinal obstruction was made. The patient was becoming increasingly weak therefore a guarded prognosis was given. As all attempts to alleviate the condition had failed, surgery was deemed advisable.

Operative Procedure.—The patient was first given a capsule containing one-half grain of nembutal and five grains of aspirin about a half-hour before the operation. Procaine, 4cc of a 2% solution, was administered epidurally just prior to the operation. Ether became necessary as the operation progressed.

The patient was restrained in dorsal recumbency and the abdomen, posterior to the umbilicus, was shaved and properly disinfected. A gauze ligature was placed around the penis to prevent contamination of the operative area by urine. A sterile shroud was placed over the area and a small incision, two inches

lateral to the penis, was made through the skin, muscle and peritoneum.

The affected portion of the intestine, a congested section about 15 inches in length, was located and brought out through the incision. A small, hard mass was easily discernible within the section. Although the area was extremely congested it appeared to be still viable, therefore, resection of the inflamed section of the bowel was not considered necessary. An incision was made over the obstruction on the side of the bowel opposite the mesenteric attachment. The mass, which consisted of the head of a rat, numerous strands of hair and blades of grass, was removed with forceps. The intestine was then thoroughly cleansed with warm physiological saline solution.

The incision was closed with Czerny-Lembert catgut sutures and again cleansed with warm saline solution. Sulfanilamide powder was sprinkled lightly over the wound. The omentum was pulled over the incision and sutured in place with several interrupted sutures. The cut edges of the peritoneal and muscle layers of the abdominal incision were each brought in apposition with continuous sutures of catgut. The skin was closed with three mattress sutures of linen. Powdered sulfanilamide was placed on a cotton-gauze pack and bandaged in place.

Outcome.—The patient succumbed several hours following the operation. No significant lesions were observed upon post-mortem examination to account for the death, which was therefore attributed to shock and toxemia.

RAYMOND C. WILLIAMS

Chicago, Illinois

Bovine Auto-amputation

The accompanying illustration shows a two-year-old, registered, Hereford heifer owned by Bus Owinham, St. Francis, Kansas. The writer discovered her while he was doing routine area testing for tuberculosis accreditation. It represents a case of auto-amputation of the left forelimb about four inches below the carpus and demonstrates how well a cow can manage herself on three legs.

The heifer was calved December 10, 1943. According to the owner, in the late summer of 1944, an infection of unknown origin developed in the lower leg accompanied by extreme swelling. This was rapidly transformed into an open purulent, necrotic process and soon became infested with maggots. The owner believes that the maggots contributed a great deal to the survival of the animal. A more detailed description of the changes that occurred in the leg would be desirable but is obviously unobtainable.

It is estimated that the interval between the first appearance of the swelling in the leg and the healing of the stump was approximately three months. During the entire period the animal was in a critical condition and great loss of flesh occurred with general stunting of growth. At present the stump of the limb is well healed with an area of scar tissue not covered by hair of about the size of a silver

Heifer with amputated foot. Stump outlined. Note the good flesh this animal is carrying

dollar. There is no evidence of a latent infection in the stump.

The main treatment employed was daily irrigation of the leg with antiseptics of the home concocted variety.

At present the animal is in excellent health and carries as much flesh as the other cattle in the herd. Although she is somewhat dwarfed for her age (estimated weight 725 pounds at the age of 29 months), she is extremely alert and rather wild. It took a little patience to get her cornered to make the tuberculin injection. When pricked by the intradermal needle she kicked violently.

The heifer grazes on the buffalo grass pasture with the rest of the herd and is able to keep pace with them. Ordinarily such an unfortunate individual has a tendency to isolate itself. During the past winter the owner relates that it was necessary to feed her separately as she was unable to maintain a place at the feed trough.

The etiology is purely speculative. The owner believes that the leg was probably stepped upon by a horse and a compound fracture resulted.

The heifer is too much dwarfed to be a successful breeder and the owner contemplates butchering her for beef for his family.

CLARENCE H. THOMPSON, JR.

Colby, Kansas.

Breeding Efficiency Lowered Following Anaplasmosis

In an outbreak of anaplasmosis in a herd of 4,300 Hereford cows over 500 cases of the disease occurred. Of these, 275 cases were treated[1] in various ways. All of the treated animals were identified, but were allowed to remain in the different pastures on the ranch. After the outbreak had subsided, the owner removed 71 of these previously treated cows that were in good condition and shipped them for immediate slaughter. Of the 204 that remained after treatment, 168 were isolated in a separate pasture and were withheld from sale. They were in an unthrifty condition.

We had advised the owner that the recoverd cases would remain carriers of the *Anaplasma marginale* and for that reason would always be a source of possible infection of other animals. Since these recovered cows had been herd bred and were not suitable for sale as meat animals, the owner desired to keep them during the winter in an attempt to get them in better physical condition for sale, and also to allow us to study the breeding efficiency in the recovered cases.

Retaining these animals on the ranch was contrary to our recommendation, but the rancher felt that immediate sale of them in the poor condition then prevailing, would occasion a considerable loss, not only in the lost weight of the animals, but also in the loss of their potential offspring the following spring. By January some of the cows showed heavy with calf. During the winter and early spring, the animals were well cared for and were given an extra ration of feed. Two of the animals died during the winter and were disposed of *via* the rendering works.

Previous to the outbreak of the disease, the breeding efficiency of all cattle on the entire ranch was 82%, which is considered satisfactory for pasture-bred, range animals in that area.

Of the 166 adult cows that remained, 60 of them gave birth to live calves, which represents a 36% calf crop. The same cows were re-bred in early spring and retained in isolation. The calves were removed from them in October and sold as feeders. The following year the 166 cows raised 95 calves, or a 57% calf crop. Thus although there was a gratifying improvement in breeding efficiency fertility was still very low. In the fall, all of the cows and calves were sold at a terminal market. The adult cows were slaughtered and the calves were sold for feeders.

From our observation in other outbreaks of anaplasmosis and as a result of this study, we conclude that the breeding efficiency of cows that recover from an attack of anaplasmosis is reduced and fertility is only partially recovered after two gestation periods.

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Sioux City, Ia.

[1] Smith, H. C., and Howell, D. E. The chemotherapy of 275 cases of anaplasmosis. *Vet. Med.*, 39:10, pp. 377-387. 1944.

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Observations on the Peafowl*

The peafowl, (Pavo sp.) is a close relative of the pheasant family and apparently originated in India. Being a bird of great beauty, there have been recordings as far back as the references given in the Bible,[1] and of the writings by Pliny, in which the peafowl was described. Pliny described the moulting and breeding of them in some detail. Many fables have been told of the peafowl, most of them dealing with the evil that was connected with the presence of the many "eyes" on the train of the male's tail. Down through the ages, literature has always condemned the peacock, although no adverse comments or superstitions are recorded. Even at the present time, American theatrical groups hold to the superstition that evil follows the peacock, and will never allow a peafowl to be present on the stage or to be painted on the scenery. The only explanation of the origin of this superstition is the following vague tale:

"When God created the peacock, the seven Deadly Sins gazed with envy at the splendid plumage of the bird and complained of the injustice of the creator. 'Verily, I have been unjust' said He, 'because I have already bestowed too much on you. The Deadly Sins should be as black as night, who covers them with her veil.' And taking the yellow eyes of Envy, the red of Murder, the green eyes of Jealousy, and so on. He set them on the feathers of the peacock and gave the bird it's freedom. The bird departed and the Sins, thus despoiled, follow ever in its track, trying in vain to recover their lost eyes."

There are at present, several different species of peafowl in the United States. They are confined largely to country estates, breeding farms, zoological gardens, city and state parks and national parks. Many well-to-do farmers and ranchers have some of these around the place to add beauty and novelty. Of all of these, the Indian or blue peacock *(Pavo cristatus)* is the most common.

There are very few published works on the peafowl. Perhaps the best and most recent is a book by William Beebe, "The Pheasants, Their Lives and Homes." This gives a description of the native habitat of the peafowl, its

*The author wishes to acknowledge the help and cooperation of Professor L. F. Payne, of Kansas State College.

plumage and wild habits. Some of the characteristics of the peafowl family taken from this book are:

The peafowl is a gregarious bird. It voice is almost indescribable, being a piercing, loud, raucous call, quite unmusical and very powerful. The cock roosts with his harem of one to five females. He will fight furiously for the well-being of his family. In captivity, the peacock has caste and keeps aloof. The basic purpose of the male's strutting is to attract the female, and his courtship, while not the most complex among gallinaceous birds, has no equal.

At present the plumage is of little market value, except for decoration. Because of their brilliant colors, various shades and the blending of the many different hues, the feathers have many different decorative uses. In the 19th century almost every parlor of the old farm houses contained a vase of gorgeous peacock feathers.

Plumage

The head of the male rests upon a solid, graceful, beautiful neck and is covered with small, curly metallic greenish-blue feathers however, the area around the eye and the commissures of the mouth is bare of feathers and is a blue-ivory color. A few long delicate feathers one to two-and one-half inches long, form in the shape of a horseshoe.

The fan-shaped neck feathers are small and lacy, of brilliant blue, edged in black and tinged with a metallic green.

Feathers of the lower back, rump and especially the upper tail coverts are enormously developed. These feathers, making up the back covering, blend from the blue feathers of the neck, into the small feathers making up the base of the train. They are small, lacy and gold, green and blue mottled.

A detailed study of the long tail coverts which make up the train, shows three distinct types of feathers present. These feathers differ in structure, number, length and color. However, when the male struts, all are necessary to blend together and make the beautiful spectacle that he is. The most numerous and, surely, the most outstanding in beauty of the coverts, are the ocelli or "eye" feathers.

These feathers number 175 on an adult male and range from one-and-one-half to 48 inches long. They are composed of a long, white glistening shaft, which has relatively few barbs on either side. These barbs are located on the shaft and range from 10 to 12 to the linear inch, and are from three to five inches long. The ocelus is the outstanding feature of the feather. These feathers are described in the "Catalogue of Birds"[4] of the British Museum as follows:

"——are ornamented with brilliant subterminal ocelli, green with purple pupils in a field of golden copper, and circumscribed with rings of gold, copper, and other metallic hues ——."

Some of the outer tail coverts are blade-shaped, being webbed on one side with long barbs up to nine inches in length, and having none on the other side. These tend to give the feathers a sickle shape. These "sickle" feathers average 10 to 43 inches in length and are greenish-golden in color, and compose the outer-most part of the fan, when the tail is spread.

The third type of feather is the "fan" feather. These are the longest of the feathers and appear to serve as guards for the more delicate ocelli feathers. They are about 5 inches long, and are similar to the ocelli feathers but terminate with a crest-shaped tuft, and compose the outer border of the fan. They lack the ocelli in the tuft.

There may be some confusion as to the true tail feathers and the tail coverts. The tail is composed of the plain drab feathers, that are heavy and strong, and are inserted upon the tail head of the body. The coverts are the most colorful of the train, and make up the major portion of the fan when spread. These are inserted in the region of the back and rump of the bird. The true tail feathers are responsible for lifting the train into position when the male struts. They throw the train up, and hold it in position. A quivering motion of the male lets them fall into position.

The moulting process of the male begins in mid-July and August, and is usually very slow. The feathers either fall out, or are pulled out, usually on the roosting place. After he loses his train, the peacock goes into seclusion. It is the opinion of some that he dislikes to be seen without his train, especially by his mate. The rest of the feathers moult irregularly and are rarely missed. The new tail starts to develop in about five to six months after completely moulting, and requires four to six months to obtain full length.

1. The Bible, I Kings, x:22; II Chronicles ix:21; Job xxxix:13.

2 and 3. Beebe, William, "The Pheasant, their lives and homes." Volume II, pages 220-263.

4. British Museum Catalogue of Birds. Volume 22, page 369. also

Beebe, William. A monograph of the Pheasant, Volume 4.

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L. C. PAYNE

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You'll Be Interested to Know That . . .

In July Dr. William H. Feldman, Mayo Foundation for Medical Research, was awarded the Alvarenga prize for the year by the College of Physicians in recognition of his studies upon chemotherapy of tuberculosis. The yearly award was established by the will of Pedro Alvarenga of Portugal to be given each year on the anniversary of his death—July 14, 1883.

■

Dr. A. C. Ivy, formerly professor of physiology of Northwestern University has been appointed the distinguished professor of physiology in the graduate school and vice-president of the University of Illinois. Dr. Ivy is well known to the Veterinary profession as he has contributed to veterinary programs often.

Dr. C. M. McFarland

Dr. Claude M. McFarland, KCVC '00, for the past 16 years sales manager of the Missouri Valley Serum Co., Kansas City, Kans., has been elected president of the company to succeed the late Dr. E. B. Hollecker.

Prior to becoming affiliated with the Missouri Valley Serum Co., Doctor McFarland was vice-president and sales manager of the Sihler Serum Co., 13 years and with the Purity Biological Laboratories three years. He entered the veterinary supply field from the federal Bureau of Animal Industry in which he had served successively in Field Inspection at Salt Lake City and Billings, Montana; Meat Inspection at St. Joseph, Mo.; Field Inspection at Lynchburg, Va.; again on Meat Inspection at St. Joseph (Assistant Inspector in Charge); Traveling Inspector in the Mid-West; Meat Inspection at Spokane, Wash. (Inspector in Charge); Virus, Serum, Toxin Control at Kansas City, Kans., and later at Sioux City, Ia. (Inspector in Charge). During the 1914-15 outbreak of foot-and-mouth disease he was detailed for that work in Montana and North Dakota.

He enters upon his present duties with a broad experience in veterinary biological production and distribution, and unusually wide acquaintance among veterinarians.

The Yakima County Humane Society of Yakima, Wash., upon presentation of a dog license without fee to a war veteran Doberman Pinscher announced that the society would extend like courtesy to all service dogs in the county.

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Dr. Robert E. Habel, recently separated from the Army where he served in the India-China theater, has accepted a position as instructor in the department of veterinary anatomy in the College of Veterinary Medicine of Ohio State University.

■

Dr. Glenn Van Ness has become Associate Poultry Pathologist in the Florida Agricultural Experiment Station. He was formerly head of the Veterinary and Bacteriology Department, University of Arkansas, Fayetteville. A new poultry disease research laboratory will be constructed to house the expanded poultry disease research program for which appropriation has been made by the state.

■

Deferment of Medical, Dental, Osteopathic and Veterinary Teachers Proposed

The warning that failure to defer college teachers from the draft has resulted in the proposal by the National Selective Service that an estimated 5,000 "essential" college teachers be deferred. Eligible for deferment under the plan would be teachers engaged in physical sciences, medicine, dentistry, osteopathy and veterinary medicine.—*J. Am. Med. Ass'n.*

Increasingly National Dog Week, Inc., is being recognized as the spokesman and champion of the dog. For 19 consecutive years it has not only sponsored National Dog Week observances (dates this year: Sept. 22-28) in communities all over the country, but has also maintained a year-round office of service to dog owners everywhere